

Ministry of Transport

# INDUSTRIAL DEMAND FOR TRANSPORT

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*A study of the determinants of demand for transport, of transport facilities and the characteristics of consignments in manufacturing industry. A summary report of this survey was published under the title of Transport for Industry. H.M.S.O. price 6s. 6d. net.*

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# Introduction

In recent years a substantial amount of information on freight movement in the United Kingdom has been collected and analysed in such studies as the Ministry's surveys of road goods transport, the Railway surveys of rail wagon movement, and the Board of Trade's surveys of coastal shipping traffic. All these studies have, however, centred around the suppliers of transport services and very few investigations have been made of the demand side ie from the point of view of the users of transport services. This present survey was designed to fill some of this void.

The inquiry was first planned in the latter part of 1965, and after preliminary investigations the main body of the data was collected in 1966 and 1967. Two broad types of information were collected from some 720 establishments in manufacturing industry: the first type related to the transport arrangements of the establishments and the traffic despatched by them during one year distinguished by the mode used; the second type of information collected related to a sample of consignments despatched during the survey period.

The first source of information provided data on such factors as the size and composition of traders' vehicle fleets; the frequency of A contract and C hiring arrangements; ownership and use of rail sidings and canal berths; annual traffic generated. The second source provided data on the nature of consignments and the influence of factors such as consignment weight and type, containerisation, origin and destination, and price upon the distribution of traffic between modes.

The survey, although large enough—in terms of the number of firms and consignments investigated—to give reasonably accurate information on the total transport market and also on the markets for the transport of certain commodities, was not large enough to give accurate results for specific markets eg the carriage of consignments of chemicals of over 1 ton for hauls of over 100 miles. It must be remembered, therefore, that the results refer to an aggregation of specific markets and do not, therefore, necessarily, hold for any one specific market.

## Presentation of results

The results of the survey are presented in three parts:

- (a) PART I contains the results of a probability analysis which has been employed to indicate the relative influence of factors on the distribution of traffic between modes. This technique is both complex and experimental but it has been presented in a non-technical manner so as to make it available to as wide an audience as possible and throughout references have been given to relevant sections in Part II where the matter is considered in the conventional tabular form.
- (b) PART II contains an analysis in tabular form of factors influencing the distribution of traffic between modes. This Part consists of eight chapters, the first of which deals with the main factors influencing modal split, whilst the other

chapters are devoted to special aspects such as containerisation and damage and losses. The findings of Part I are frequently illustrated in tabular form throughout Part II.

- (c) **PART III** deals with other findings of the Survey which are not specifically related to the distribution of traffic between modes, and consists of four chapters covering the nature and composition of consignments; ownership of transport facilities; expenditure on transport; and a detailed account of the use made of rail transport.

#### Technique used for the survey

Two types of information were collected: by use of a general questionnaire taken by an interviewer to each establishment information was collected on such factors as number of employees, nature of business, annual tonnage shipped by and expenditure on various modes; and information on consignments was collected by the completion of special consignment notes for a sample of consignments leaving each establishment (see Appendix I).

Manufacturers were asked to complete special consignment notes that asked questions *inter alia* about the type of commodity, weight, destination, price if transported by a professional operator and mode used: this is information which is common to the records of many firms, but as it was important to ask additional questions it was necessary to complete the notes for a sample of consignments leaving the firm during the survey period and not retrospectively. The additional questions related to what are frequently referred to as 'special features' attached to consignments: e.g. the use of containers, special vehicles, regularity and agency. By the use of a postcard dispatched with the consignment to be filled in by the consignee it was possible to obtain information on damage and speed of delivery and by enquiry after the survey it was possible to establish a record of consignments lost.

The special consignment note, however, did not include two important pieces of information; namely, the cost of carriage by transport on own account and the charge for carriage by alternative modes of transport. Shippers or consignors were, of course, not in a position to give the exact cost of sending individual consignments by their own means of transport, so there was the problem of arriving at a method of cost allocation. The least unsatisfactory method that could be established was an average cost per ton measure, so details were collected in the general questionnaire on costs of own transport and tonnage shipped, and costs were allocated to individual consignments on this basis<sup>1</sup>. This method is open to several objections but it did appear to be the one most frequently used by shippers and it therefore the important one with respect to modal choice. As regards the price of alternatives, clearly this is of importance in any demand study for the price of particular mode is high or low relative to the prices and qualities<sup>2</sup> of alternatives. Two broad approaches to this problem are possible: firstly, one could have obtained quotations for sending particular consignments by alternative modes or ask the shippers to obtain quotations, or secondly, the shippers could have been asked to say what they thought would be the charge by an alternative mode without actually obtaining a quotation. In a perfect market the shipper would have a perfect knowledge of prices and there would be no difference in the charges resulting from the two approaches, but in the imperfect market which exists this is not the case, for a shipper might have a completely false impression of prices or even no knowledge at all. It is, however, the second approach which is the important one for a demand

study, for it is the subjective assessment of the shipper which determines modal choice. In order to obtain information on this, therefore, a sample of the consignment notes which had been completed was returned to each firm in the survey with a request for their assessment of the charge for sending the particular consignments by alternative modes.

The phrasing of the letter requesting this information was of great importance, for if the shipper had no knowledge of alternatives it would have spoiled the purpose of this part of the survey had he specially obtained a quotation or made up some figure in order to appear efficient. It was stated in the letter, therefore, that it was quite expected that in many instances alternatives would not be known, and that the shippers were not being requested to make special enquiries in order to establish alternative prices.

#### Survey method

Two surveys were, in fact, carried out; both related to firms in the manufacturing sector but the one was confined to a particular area of the country and the other had no area constraint but was confined to particular commodities. The first survey, called the general survey, was designed particularly to provide demand information for a cost model upon which the Ministry of Transport is currently engaged. This cost model, in its preliminary form is devoted to two routes—London to Newcastle and Liverpool to Glasgow—and the general survey was confined to firms within a catchment area drawn around these two routes (see map 1 below). Although this included the West Midlands, Wales, the South West and a large part of Scotland, comparison of the establishments drawn in the survey with national figures showed that they were fairly representative of industry in the country as a whole (see Appendix I).

The grouping of commodities under thirteen broad headings in the General Survey was bound to obscure the importance of commodity in the transport market due to the heterogeneity of the groupings. The size of sample needed to have allowed commodities to be divided into a large number of homogeneous groupings would have been enormous and this was completely outside the budget. It was decided, therefore, to conduct a second survey of five hundred establishments which would be confined to specific industries.

In selecting these industries three factors were of great importance: firstly, the industries chosen should be important to transport providers; secondly, the commodity, manufactured by each industry should be homogeneous; and thirdly, each industry should differ in its transport requirements. Five industries were selected and in order to preserve homogeneity each of these was confined to specific *Minimum List Headings* and not to whole Orders. The industries chosen were:

- 1 Foodstuffs (MLH 214 and 218)
- 2 Chemicals (MLH 271)
- 3 Iron & Steel (MLH 311)
- 4 Electronic equipment (MLH 364)
- 5 Paper (MLH 481 to 483)

<sup>1</sup> For short run decisions on the use of one's own vehicle it is clearly only the marginal (variable) cost that is relevant, there is, however, very little difference between average and marginal costs in the instance of fixed costs are minimal. Vehicles are usually kept in loading bays or outside parks for which no costs are apportioned to the transport account; all but a small fraction of vehicle depreciation costs are variable; and office staff, under contract, concerned with transport are usually employed elsewhere in the firm.

<sup>2</sup> By qualities it is to be understood all characteristics of service other than price (or cost of own account transport).

With the exception of Paper these commodities are important constituents of road and rail traffic. Paper was included as it is a very homogeneous commodity where consignment size varies enormously *eg* from patterns to bulk shipments from mills, and therefore the influence of weight upon modal choice can easily be isolated. Foodstuffs was selected because it is a perishable commodity which requires speedy delivery and possibly special vehicles; chemicals because it requires special facilities both from the point of view of danger and the carriage of liquids and powders in large quantities; iron and steel because it is a bulk good with frequently little risk of damage. Electronic equipment was the most heterogeneous commodity even when confined to one Minimum List Heading, but it was selected as a commodity where there is a high risk of damage in carriage.

### Sampling frame

One of the major difficulties encountered in carrying out the study was obtaining the frame of all establishments in the country. The Board of Trade has such a record analysed by Standard Industrial Classification and numbers employed, but as this information is collected under the Statistics of Trade Act it is strictly confidential. The most satisfactory frame that could be obtained was from the (as then called) Ministry of Labour, and this was made available only under stringent conditions. This frame was divided into the Ministry of Labour's nine Administrative Regions, and into broad industry groups *eg* manufacturing, mining and quarrying, shipbuilding and distribution, and the Minimum List Heading of the Standard Industrial Classification was given for each establishment. Unfortunately the record was not complete: there was no record of establishments with less than eleven employees, a one in four record of establishments with more than ten employees but less than one hundred employees, and only a complete record of establishments with one hundred or more employees. As the establishments were not distinguished by a size code it was not possible to correct for the size bias in drawing the sample. The top heaviness of the sample is, however, not an undesirable property as the larger firms are the important users of transport.

### The sample (General Survey)

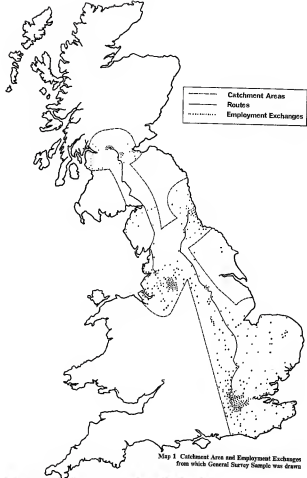
A catchment area was derived enclosing the areas where it was considered firms most likely to use the two cost modal routes were located (see map 1 below), and the sample of establishments was drawn from within this catchment area.

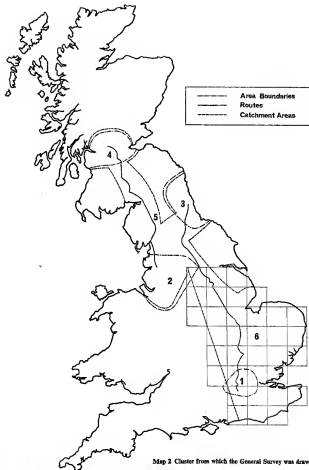
Because of the very large number of establishments in the sampling frame it was decided to use a two stage sampling technique: a sample of employment exchanges was first drawn and then a sample of establishments was drawn from the selected employment exchanges.

The distribution of employment exchanges within the catchment area is shown in map 1, and it can be seen that these form four large clusters; a fairly wide distribution in the south-east (excluding London); and a few scattered occurrences between the clusters around Liverpool and Glasgow—the six areas are shown on map 2. In order to ensure the drawing of the sample did not have an area bias one in ten of the exchanges was drawn randomly for each of areas 1 to 5; the exchanges in area 6 were so widely dispersed that to have drawn exchanges randomly would have substantially increased the cost of interviewing. It was decided, therefore, to divide this area into squares (see

map 2) and to draw randomly one in ten of the squares, all the exchanges in the selected squares were then included in the sample.

Fifty employment exchanges were drawn in total involving two thousand and seventy nine establishments. It was intended to draw five hundred establishments for the survey, and as the exchanges were listed in alphabetical order every fourth one was drawn giving a total of five hundred and nineteen establishments.





Map 2 Cluster from which the General Survey was drawn

# The sample (Commodity Survey)

As only five commodities were being considered in the Commodity Survey it was not practicable to confine the survey to the two cost model routes, but at the same time a nation-wide survey would have severely strained the interviewing resources. An additional problem was that of sorting out the establishments with the required Minimum List Headings from the thousands of establishments in the frame. The tendency, however, for firms in the five industries to locate in specific areas enabled a partial solution to both these problems. From Ministry of Labour figures<sup>1</sup> it was possible to determine the number of employees engaged in industries in each of the required Minimum List Headings for the Ministry of Labour's nine administrative regions. Starting with the most important (in terms of employment) region for each Minimum List Heading and progressing to the least important, sufficient regions were taken into account to obtain a minimum of 75% of employees in the country. In five instances this involved four administrative regions and in three instances five. The regions selected for each Minimum List Heading with the percentage of the Great Britain working population engaged under these Headings for each region is given in the table below.

Administrative Regions from which the five selected industries were drawn

| MLR | Ministry of Labour Administrative Region   | Total % |
|-----|--|---------|
| 214 | London & South East (21.6%); Scotland (16.3%);<br>Yorks. (15.2%); North Western (14.1%); Midlands<br>(13.5%).            | 77.3    |
| 218 | London & S.E. (23.4%); Eastern & Southern<br>(23.4%); North Western (18.0%); Yorks. (13.1%);<br>Midlands (10.8%).        | 89.3    |
| 271 | North Western (27.7%); London & S.E. (29.4%);<br>Northern (16.1%); Yorks. (12.0%).                                       | 75.6    |
| 311 | Yorks. (23.8%); Wales (23.1%); Northern (15.4%);<br>Midlands (12.2%).  | 84.9    |
| 364 | London & S.E. (39.0%); Eastern & Southern<br>(26.4%); North Western (9.1%); Midlands (8.9%).                             | 81.6    |
| 481 | London & S.E. (31.4%); Scotland (18.0%);<br>North Western (17.6%); Eastern & Southern<br>(10.7%).                        | 78.4    |
| 482 | North Western (21.6%); London & S.E. (20.7%);<br>Midlands (14.7%); Eastern & Southern (14.1%);<br>South Western (10.7%). | 81.2    |
| 483 | London & S.E. (34.7%); North Western (22.4%);<br>Eastern & Southern (15.7%); Midlands (8.9%).                            | 89.1    |

As the sampling frame was divided into administrative regions this method reduced the work of listing out the establishments with the required Minimum List Headings by about half. Although no region was excluded by this method the tendency of industries to locate in specific parts of regions reduced the task of interviewing enormously.

Establishments were listed in alphabetical order under each Minimum List Heading and every fourth one was drawn for the sample. Five hundred and two establishments were thus drawn and were distributed among the five commodity groups as follows:

|                  |     |
|------------------|-----|
| 1 Foodstuffs     | 80  |
| 2 Chemicals      | 82  |
| 3 Iron and Steel | 74  |
| 4 Electronics    | 106 |
| 5 Paper          | 160 |
| Total            | 502 |

Six of the establishments drawn were the same as those in the General Survey, so they were removed from that survey leaving five hundred and thirteen establishments in the General Survey and five hundred and two establishments in the Commodity Survey.

## Survey period

Because of the work involved in completing the consignment notes it was considered that the maximum number of notes that a firm should be asked to complete was 100, and that these should pertain to one week in the year. Because of the large number of firms to be visited and their wide geographic distribution it was not possible for all firms to give the information for the same week. It was decided, therefore, to spread the survey over September and October 1966 as these were two months that were least subject to seasonal bias. During this particular period there was also no chance occurrence, such as the seamen's strike which had occurred earlier in the year, which was likely to bias the results.

<sup>1</sup> Ministry of Labour Gazette February 1965.



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# Part I

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## Determinants of modal choice: a probability approach

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A number of studies of demand for goods transport have been made<sup>1</sup> which have attempted to rank the determinants of demand, but they have usually relied upon asking firms using transport to rank a number of factors in order of importance, and the firms' answers have then been weighted in the final aggregation to take account of size. Such a technique is open to a number of criticisms: firstly, although it can provide very useful information on general transport requirements such as the necessities of reliability and speed, it does not provide information on how important such factors are in determining the use of one mode as opposed to another. Thus, although speed was found in the present survey to be a very important general requirement, if an equally fast service is provided by two modes then speed is not a factor that determines the choice of one as opposed to the other. Secondly, not all factors that determine choice have been taken into account in these studies, thus although such factors as ready availability and the performance of ancillary services are adequately covered, others such as the type of commodity being carried, and the destination of consignments are not. Thirdly, such studies have treated factors in isolation instead of allowing for the simultaneous interaction of all factors upon modal choice. The vast majority of firms use a number of different modes with modal choice depending upon such factors as length of haul, destination, commodity and consignment size, as well as the type of factors used in previous studies such as reliability and performance of ancillary services. The determinants of choice, therefore, can only be measured if they are related to a particular consignment or group of consignments.

Besides the factors relating to the consignment there are factors relating to the firm itself which may influence the distribution of traffic between modes. Clearly the type of transport facilities that it has at its immediate disposal eg own or hired

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<sup>1</sup> For examples in the UK see: Survey of 'C' licensed vehicles by the roads (1959) and Transport Decisions of Certain Firms in the Black Country by W. K. Cook (*Journal of Transport Economics and Policy*, September 1967).

vehicles.<sup>1</sup> 'A contract' arrangements, private rail sidings, its location, and its size can all play a role in the choice of mode by a firm in any particular instance. Information on these factors was collected, therefore, in the general questionnaire.

It has already been noted in the Introduction that it is not the actual price of alternative modes which influences modal choice but what the shipper *thinks* is the alternative price. The importance of the subjective assessment as opposed to the objective factual information in modal choice applies to factors other than the charges by alternative modes. Thus the information collected via the consignment notes on journey time and loss and damage does not tell us how important these factors are in modal choice—it is the shipper's subjective assessment of the relative performance of the different modes with respect to these aspects of carriage which is the determining factor. Also one encounters particular difficulties of analysis in this respect when one considers the aggregate transport market. If, for instance, the shipper considers freedom from damage to be important in his choice of mode he will send consignments that are liable to damage by a mode where they are least likely to be damaged. This will result in the records of the different modes being brought together when one considers the transport market as a whole<sup>2</sup>. The aggregate factual information on damaged consignments sent by different modes will not provide evidence, therefore, on the efficiency of each mode with respect to this factor. In order to obtain information on the importance of these three factors on choice of mode by the shippers several questions were placed in the general questionnaire taken by the interviewers to the firms. These subjective questions related to ready availability, speed<sup>3</sup> and good record with respect to damage and loss, and the shipper was to state if any of these were taken into account in the choice of the main modes he used<sup>4</sup>.

There are, therefore, three broad groups of factors which bear upon modal choice. Firstly, the completely factual information relating to the consignment or its size, destination, use of container, ancillary services performed; secondly, the factual information relating to the firm itself, or its size and location; and thirdly the subjective assessments of the shipper relating to freedom from loss and damage, speed, ready availability and charges by alternative modes. Through the information collected in the general questionnaire, the consignment notes and the subsequent survey on charges by alternative modes, it was possible, therefore, to consider the simultaneous interaction of these factors upon modal choice in a particular instance.

One of the problems, of course, is that many of these variables are inter-related and one of the purposes of carrying out the type of analysis employed in this chapter was to establish the degree of any inter-dependence and take account of it in attempting to determine the influence of the individual factors on the distribution of traffic between modes.

The type of analysis employed<sup>5</sup> in this Part has two aims: firstly, to determine the relative importance of a factor (or *urgency*) in explaining the use of one mode as opposed to another, and secondly, to determine by how much the occurrence or non-occurrence of that factor increases or decreases the chance of a consignment going by one mode as opposed to another. Thus the analysis does not seek to rank the importance of factors in general transport demand; it aims, in contrast to previous studies, to illustrate how these factors influence the choice of a particular mode as opposed to another.

The probability technique employed is one that allows for the simultaneous inter-action of a large variety of factors, and in-

volves the analysis of consignments sent by two specified modes. Thus, if one considers transport on own account and professional road haulage an analysis of the consignments sent by these two modes is made in an attempt to see what factors influence the use of the one mode as opposed to the other. The degree to which any single factor explains the use of the one mode as opposed to the other is calculated, and also by how much it increases or decreases the probability of a consignment going by one of the two modes, other factors considered<sup>6</sup>.

It is to be noted that the determinants of the distribution of traffic between modes are considered for the total transport market in manufacturing industry, and the reader is again reminded that these results do not necessarily hold for specific transport markets. They are presented to illustrate the kind of results that one can expect from this type of analysis, and it is hoped that such analysis will eventually be applied to micro markets where the results will not suffer from the problems of heterogeneity and cancelling out of factors encountered in an aggregate situation.

The factors considered in the analysis under the three broad groupings are:

#### *Factors relating to consignment*

Length of haul; regularity of shipment; consignment weight; use of container; use of special vehicle or wagon; inter-establishment movement; consignment required more urgently than usual; performance of ancillary service; type of commodity; destination; journey time.

#### *Factors relating to firm*

Location; number employed; ownership of 'C' licence fleet; 'A contract' or 'C' hire arrangements; ownership of rail siding.

<sup>1</sup> The analysis only considers the decision whether or not to use a vehicle that has already been purchased. It does not consider the decision leading to the purchase of a vehicle.

<sup>2</sup> Because different modes tend to specialise in different types of traffic it is difficult to compare their performance under exactly similar conditions.

<sup>3</sup> Speed was divided into three categories:

(a) Speed to meet customers' requirements.

(b) Speed to keep stock levels low.

(c) Speed to ensure high utilisation of vehicles or wagons.

These were, therefore, three subjective questions in all.

<sup>4</sup> It was considered necessary to combine the choice to two in order to prevent the shipper being factors for the sake of doing it and which probably had no influence on modal choice. It is because of the desire of the shipper to appear efficient in front of the interviewers that one of the reasons for rejecting the methods used in previous demand studies was that they required a ranking of factors by the shipper.

<sup>5</sup> Details of the technique of analysis are contained in Appendix 2 together with the results and commentaries.

<sup>6</sup> One is tempted to conclude that as the influence of the other factors is taken into account when assessing the importance of a particular factor that the others perform conditions of partial equilibrium analysis have been observed. But this is to overstate the case, for as has already been argued there is a tendency for certain classes of traffic to be sent by specific modes and, therefore, when considering the influence of a particular factor all other conditions cannot be held constant. Thus if all 50 ton consignments of coal for loads of 100 miles are sent by rail, one cannot compare the journey times of road and rail for the carriage of 50 ton consignments 100 miles distant without because road shipments of this nature would not be of length of haul where 80% of transport on own account consignments are carried less than 30 miles compared with only 14% of rail consignments. In the analysis, therefore, the expression 'other factors considered' has been used rather than certain parties.

Ready availability of a mode; speed of delivery to meet customers requirements; speed of delivery to ensure quick turn-round of vehicles; speed of delivery to keep stock levels low; good record with respect to damage; good record with respect to loss; charges by alternative modes.

In the following paragraphs a summary of the results has been given for each pair of modes but detailed results and technical commentaries are contained in Appendix 2. Throughout this section references have been given to the relevant tables and commentaries in Part II where an analysis of modal choice is made in the traditional tabular form, so as to facilitate interpretation of the results.

#### Transport on own account/Professional transport<sup>1</sup>

Length of haul was by far the most important determinant of whether a consignment went by transport on own account, 'explaining' 24% of the distribution of traffic (in terms of consignments) between these two modes, and having an explanatory power five times as great as the next most significant factor consignment weight (see p 24 of Part II for an illustration of this point in tabular form). As might have been expected the greater the length of haul the greater is the probability of a consignment going by professional operator. However, every 25 mile increase in the length of haul does not increase the probability of carriage by a professional operator by the same amount. Thus if one considers a haul of 25 miles and one of 50 miles there is a greater chance of the consignment going by professional operator in the latter case than in the former; and if one considers hauls of 50 miles and 75 miles there is also a greater chance of carriage by a professional operator in the latter case than in the former, but the difference is not as great as in the previous example. This is illustrated in the table below, where it can be seen that an increase in the length of haul from 25 miles to 50 miles increases the probability of carriage by a professional operator by 11%, whereas an increase in the length from 50 miles to 75 miles increases the probability of carriage by a professional operator by only 6%.

| Length of haul increased from to |          | Increased probability of carriage by professional operator |
|----------------------------------|----------|--|
| 25 miles                         | 50 miles | 11%  |
| 50 miles                         | 75 miles | 6%   |

Consignment weight was the second, but much less important factor determining the distribution of traffic between these modes. It may seem surprising however, that the longer the consignment the greater the chance that it will be carried on own account. This result is, however, influenced very largely by the frequent use of the own parcels service for very small consignments (this accounts for 65% of consignments up to 22 lb see Table 3 page 26) and of the rail passenger and freight train mails services for consignments of up to  $\frac{1}{2}$  ton (see Tables 3 and 4, page 26).

The factors other than length of haul and consignment weight added individually little to the explanation of the distribution of traffic, but some of the results are of great interest and these are considered in the following paragraphs. It is, however, important to emphasise again that this analysis is not attempting to rank factors which are of general importance to shippers, such

as reliability and speed, but those factors which are important in influencing the distribution of traffic between modes.

The analysis of consignments where the charge by an alternative mode was known showed that price, other factors considered, had a low influence upon the distribution of traffic, ie demand was found to be very price inelastic. Where, for example, own account transport was 25% more expensive in terms of price or cost than the cheapest suitable<sup>2</sup> alternative this only increased the probability of a consignment going by a professional operator by 6%.<sup>3</sup> Such a finding means that shippers generally put other characteristics of service before price and this is illustrated in Part II Chapter 4 where it can be seen that a large proportion of shippers knowingly use a mode that is more expensive than a suitable alternative. This result is supported by a study of parcels traffic carried out by British Rail in Leicester, where it was found that 'only 2% of firms would be persuaded to accept slower service, even by quite considerable discounts.'

The analysis of the actual charges of alternative modes made in Part II, Chapter 2 also showed that large numbers of consignments were carried by modes that were more expensive than alternatives. It must, however, again be stressed that these results relate to the total transport market and are, therefore, averages of specific markets.

Ownership of a 'C' licence<sup>4</sup> has frequently been considered to substantially reduce the use made of professional operators, but such ownership only increased the probability of carriage in the firm's own vehicles by 16%. Here it is worth stressing once more the importance of allowing for the simultaneous inter-action of all factors determining choice. Overall 48% of all

<sup>1</sup> This following analysis attempts to rank the factors that influence the distribution of traffic (in terms of consignments) between transport on own account vehicles and professional operators. Except where specifically mentioned the analysis is based upon consignments in the General Survey which went by either of these modes. As professional operator includes all types of professional operators (road haulage, rail, air, waterways, coast, air shipping, domestic air transport) this excluded all consignments in the General Survey. The analysis of prices and the prices of alternative modes is, however, only based upon the 400 consignments for which this information was available.

<sup>2</sup> In this context statistical explanation measures the extent to which a specified factor accounts for the observed distribution of traffic between modes. It may be illustrated imperfectly but lucidly as follows: If in every instance where a consignment went by rail the shipper owned a lorry, such ownership may be said to explain 100% of the decision to send a consignment by rail. If, however, this is only true in 50% of the cases of consignments going by rail, then we must seek other factors to explain the remaining 50%. Type of commodity might, for instance, account for 10 percentage points of the remaining 50% of consignments going by rail, and so additional factors can be added to try and account for the reason why the remaining consignments are sent by rail. It will be appreciated, however, that there may be a large variety of other factors, which last-minute decision to send a consignment by a particular mode, and that it is not feasible to identify and quantify all these additional factors individually. It would, therefore, be extremely rare to account for the reasons that determine choice in every instance and thus 100% explanation is seldom achieved.

<sup>3</sup> Shippers were asked to give charges by alternative modes which they could have used.

<sup>4</sup> It will be remembered that where a consignment went by transport on own account it was necessary to apportion costs of carriage to them and that the method of cost allocation was open to error. But one-half of the consignments in this analysis went by professional operator and it is, therefore, the shipper's own assessment of the cost of his own vehicles that is used, and in any case the elasticity is so low that even a substantial degree of error would not alter the conclusion.

commitments were carried on own account (see Table 7 page 28) but this is influenced by a great many factors other than actual ownership of vehicles, the most important being the length of haul. The fact of actual ownership of vehicles only increases the chance of carriage in those vehicles by a comparatively small amount. The ownership of rail sidings and the availability of vehicles under 'A contract' were likewise not very strong determinants of modal choice and only increased the probability of carriage by a professional operator by 22% and 10% respectively. After acquiring specific transport facilities, therefore, industrialists will not use them exclusively but will continue to make frequent use of other modes (see Part II, Chapter 5).

The use of special facilities and containers was interesting for the former increased the probability of carriage in the firm's own vehicles by 14%, whereas the latter reduced the probability by 11%. The provision of special vehicle facilities, therefore, only marginally increases the chance of carriage on own account indicating that such facilities are frequently provided by professional operators, and containerised traffic is in fact more predominant in professional than own account operations.

The subjective assessment factors added practically nothing to the explanation of the decision to use transport on own account or not, and the factor freedom from damage was, in fact, insignificant. What is particularly interesting, however, is the fact that where the shipper considered ready availability, speed to meet customer requirements, and freedom from loss important this increased the likelihood of carriage by a professional operator. This somewhat surprising result stems from the fact that 18% of the shippers for whom transport on own account was their main mode did not consider any of the subjective questions to be important in determining their choice of mode, compared with only 9% of the shippers for whom a professional operator served as their main mode. It may be that transport on own account operators are so used, for example, to freedom from loss and damage that they do not think of them as important, but, in whatever way one seeks to explain this one cannot escape from the fact that although industrialists consider factors such as ready availability and speed to be very important in their general transport requirements (see footnote 1) they are not of such great importance in influencing the use of either a professional operator or transport on own account.

It should, however, be noted that as shippers tend to use a number of modes the qualities looked for by a shipper as indicated by his subjective assessments do not necessarily apply to all the modes he uses but only to the main ones. The relating of these assessments to individual consignments and the modes used for them in the analysis means, therefore, that in some instances qualities will be attached to particular modes when this was, in fact, not intended by the shipper. This will lead consequently to a reducing of the significance of these assessments in the analysis and to the exclusion of marginally significant ones. But this effect should not be too great and there could, in any case, be no question of changing the direction of their influence upon modal choice. It will be seen later, however, that these results appear to be highly sensitive to the type of commodity being carried.

In some instances the type of commodity carried served to increase the probability of carriage on own account by a substantial amount. The carriage of manufactured foodstuffs, for instance, increasing the probability by as much as 33%, but this is, of course, to be expected given the shortness of the haul for this commodity.

Finally, two findings are of great interest precisely because

they relate to factors that are insignificant in determining the distribution of traffic between transport on own account and professional operators. The analysis showed that there was no significant difference, other factors considered, in the average journey times of professional and transport on own account operators, and in knowledge of charges by alternative modes of shippers using either professional operators or transport on own account.

The finding on journey time is extremely interesting for it supports the hypothesis put forward earlier on the situation *ex ante* and *ex post* the decision on choice of mode. Speed was considered important by over 80% of the shippers in determining their choice of mode<sup>1</sup> yet *ex post* the decision there was no significant difference, other factors considered, in the performance of transport on own account and professional operators. In other words shippers have only sent that traffic by a particular mode which that mode can transport quickly, and where modes have been considered to have a poor speed record with respect to certain types of traffic they have not been used. This selecting of a mode is seen, for example, in parcel traffic where the extremely efficient and speedy G.P.O. rail services carry the bulk of this traffic and for journeys other than local deliveries the large bulk of it (see Part II, Chapter 1).

The evidence on knowledge of charges by alternative modes showed that shippers using their own transport are just as likely to know the price of using an alternative mode as are shippers using professional operators (see Part II, Chapter 4).

In summary, therefore, length of haul is overpowering the most important determinant of whether a consignment is shipped in the manufacturer's own vehicle or not, with consignment weight the second, but far less important, factor. All the other factors considered added individually very little to the explanation of the distribution of traffic.

It would, of course, be interesting to know what changes there are in these determinants when a definite alternative to transport on own account is specified, and this is done in the following sections.

### Road Haulier/Transport on Own Account<sup>2</sup>

When public road haulier is the alternative to transport on own account there are few fundamental differences from the above analysis. Length of haul is again by far the most important factor, explaining 21% of the distribution of traffic between own vehicles and road hauliers and having an explanatory power seven times as great as the next most important factor—freedom from loss; the probability coefficient being almost identical to that in the previous model.

When freedom from loss is specified as important in determining choice of mode it ranks second in explanatory power, it is, however, rarely specified. Only 2% and 7% of the firms ranked it first and second respectively in their subjective assessments. It was, as mentioned previously, ranked more frequently by

|                     | % of firms |            |
|---------------------|------------|------------|
|                     | 1st choice | 2nd choice |
| Ready availability  | 54         | 25         |
| Speed               | 36         | 46         |
| Freedom from damage | 3          | 10         |
| Freedom from loss   | 2          | 7          |
| None                | 13         | 14         |
|                     | 100        | 100        |

<sup>1</sup> This analysis is based upon all those consignments shipped either by a professional road haulier or on own account.

shippers using road hauliers as main mode (3% and 12% for first and second rankings respectively) than shippers using their own fleets as main mode (2% for both first and second rankings). But the fact that it is considered as relatively unimportant by shippers indicates that the level of loss must be very low and differ little between modes, and this is borne out by the information collected on consignments (see Part II, Chapter 5).

Consignment weight was, in contrast to the previous analysis, insignificant in determining the distribution of traffic between these two modes. This means, as was previously explained, that the smaller consignments are carried by *ORO* and *Rail* and that there is no significant difference, other factors considered, between the size of consignments carried by road in the firm's own vehicles and professional hauliers' vehicles.

The remaining factors had individually little explanatory power and had the more or less identical influence to that experienced when no definite professional operator was specified. It is, however, interesting to note that ownership of 'C' licence vehicles was fairly close in explanatory power to the factor freedom from loss and had an explanatory power three times greater than was the case when no definite alternative to transport on own account was specified. This is, of course, to be expected, for once the decision has been made to send a consignment by road, as in this instance, the ownership of vehicles plays a more important role than when all alternatives are being considered.

The type of commodity being carried has been taken into account in the previous analysis by the inclusion of thirteen commodity groupings as explanatory variables. It was, however, pointed out in the Survey Method that the importance of commodity in modal split could well be reduced amongst these rather heterogeneous groupings. In order to obtain some information on this two models were run on the data collected in the Commodity Survey. This analysis was concerned with determining the significant factors influencing the distribution of traffic between transport on own account and public road hauliers for the carriage of heavy chemicals (*MLH* 271) and paper (*MLH* 481-3), and it differed from the above general model only to the extent that only hauls above and below 25 miles were differentiated i.e. the definition of a local delivery in the consignment note. The reason for the change was to attempt to establish a distance cut-off point between the modes.

In the case of Paper, length of haul had exactly the same explanatory power (21%) as in the general model, with consignments being carried for less than 25 miles increasing the probability of carriage in the firm's own vehicle by 38%. This was, as previously, by far the most important factor explaining the distribution of traffic between the two modes and having an explanatory power five times as great as the two next most important variables—ownership of 'C' licence vehicles and the availability of vehicles under 'A contract'. The importance of ownership or availability of a mode of transport is, as was previously argued, to be expected when choice is between two forms of road transport, and it is, if anything a little surprising that it did not appear so more significant in the general model.

The remaining factors were of minor importance and had similar influence to those in the general model but it is worth noting that consignment weight was just significant in influencing the distribution of traffic, with increasing size increasing the probability of carriage in the firm's own vehicles, and that the subjective assessments gave different results from previously. For the first time freedom from damage appeared as significant and increased the likelihood of carriage in the firm's own vehicles, as did the only other significant subjective assessment

—ready availability. The latter had, however, the opposite effect from that experienced in the general model.

The analysis of consignments of Chemicals had some interesting differences. Ownership of 'C' licence vehicles was in this case by far the most important factor explaining the distribution of traffic—such ownership increasing the probability of carriage in own vehicles by 33%. The influence of local delivery was still very great but its reduction in explanatory power indicated that 25 miles was too low a cut-off point to differentiate between the two modes. A re-run of the model with length of haul as a continuous variable showed, however, similar results, suggesting that 25 miles is indeed the pertinent cut-off point. What was particularly interesting about this model, however, was the fact that three of the significant factors had the opposite effect from the case of Paper. Again liability to damage and ready availability were the only subjective assessments that were significant in determining modal split but in this instance they increased the probability of carriage by public road haulier—the probabilities 21% and 11% being almost identical to the case of Paper but having exactly the opposite effect. Weight also had the opposite influence, increasing weight, in this instance, reducing the probability of carriage in own vehicles.

The tendency, therefore, of certain variables to change their sign according to the nature of the commodity could well result in the significance of these variables being lost in a global model due to their opposite effects with respect to individual commodities being cancelled out. However, this was only the case for variables of very low explanatory power even in a specialist market so this would not affect the main conclusions of the general model.

#### **Rail/transport on own account**

Length of haul was, as in previous instances, by far the most significant factor, explaining 32% of the decision to use one of the two modes. As before, the greater the length of haul the less the probability of a consignment going on own account with the probability coefficient being very similar to that when public road haulage was specified as the alternative to transport on own account.

Consignment weight was the second most important factor explaining 9% of the decision to use rail or transport on own account. As has been noticed on previous occasions the greater the weight of consignment the greater the chance of carriage on own account.

The remaining variables were of low explanatory power and behaved in exactly the same manner as has been noted previously.

#### **Rail/Road Haulier\***

Analysis of the distribution of traffic between these two modes of professional operator was of particular interest in that it allowed an assessment of the importance of price to be

\* Rail does, of course, include every type of service and these are not differentiated (see, however, Part II, Chapter 4 for a discussion of them). It should also be noted that at the time of the Survey the railway's new freightliner service was in its infancy and these may have resulted in important changes since the time of the Survey (see Part II, pp. 68 for a discussion of their possible influence).

\* This analysis is based on all those consignments in the General Survey which went by rail or road haulier with the exception of the analysis of those which is based upon only 300 consignments.

made without the problem of cost allocation that had occurred in the case of transport on own account. On the sample available the analysis suggested but did not show conclusively that where the charge by an alternative mode was known, the relationship between the actual charge and the charge by a usable alternative was not a factor that helped in determining the distribution of traffic between the two modes considered<sup>1</sup>.

Unlike in the previous analyses of transport on own account there was no factor, such as length of haul, which was more important than all the other factors in the model put together. This analysis of rail and road haulier showed, in fact, that *consignment weight* was the most significant factor, but explaining only 7% of the distribution of traffic between these two modes, with the small consignments increasing the probability of carriage by rail. The reduction of *length of haul* in explanatory power (5%) to equal second place with *freedom from loss* (when specified) results from the fact that both these forms of public operator carry over significantly greater distances than in the case with transport on own account, and that, therefore, journey length is not so important in determining modal split. However, length of haul did have the influence that one would have anticipated with increasing length of haul increasing the probability, other factors considered, of carriage by rail. The effect of increasing length of haul is, nevertheless, much less than was the case with transport on own account with a journey of 75 miles only increasing the probability of carriage by rail by 20% other factors considered compared with 68% for rail/transport on own account.

*Ready availability and speed* to meet customers' requirements were deemed important by a large number of firms (see note 1 p. 20) and both these factors increased the probability of carriage by road haulier. What is interesting about this, however, is the fact that although the shipper might have an overall requirement of speed which reduced the likelihood of carriage

by rail, when it is necessary to send a consignment more urgently than usual this is not a significant factor influencing the distribution of traffic between the two modes. This result, of course, from the provision by rail of frequent and regular high speed passenger and freight train services.

In some instances *type of commodity* played a significant role in the distribution of traffic with the carriage of Raw Foodstuffs and Iron and Steel increasing the probability of carriage by rail, other factors considered, and the carriage of Iron Scrap, Chemicals and Electrical Goods increasing the probability of carriage by road haulier.

#### Future analysis

These aggregate results show that if specific markets were differentiated by only length of haul this would go a very long way towards defining markets in which there were only professional operators or transport on own account operators. On the other hand there appear to be no factors that readily isolate professional operators into specialist markets as between themselves. Very important work remains to be done, therefore, on the determinants of the distribution of traffic between professional operators within specific markets, these markets being defined with reference to length of haul, consignment size, type of commodity and perhaps origin of consignment. Only when specific markets are analysed will the importance of quality of service be accurately assessed.

<sup>1</sup> Forcing the ratio charge by rail/charge by road haulier into the equation at a low level of significance (> 10%) the analysis showed that where the charge by rail was 25% greater than by road haulier this increased the probability of carriage by road haulier by 4%, a figure very similar to that in the analysis of transport on own account.

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## Part II

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### The determinants of modal choice: a tabular approach

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In Part I the analysis of the survey data is undertaken in a perhaps unusual fashion and many readers will be unfamiliar with this method of analysis. In this section the data is presented in tabular form and this enables the information on the influence of various factors on choice of mode of transport to be given in greater detail than occurred in Part I.

The list of factors considered in the probability analysis divided into three broad groups, *viz.* factors relating to the consignment, the subjective assessments and factors relating to the firm, (see pages 18 and 19). It would be useful therefore to group the information which emerges from the tabulated data in a broadly similar fashion and the layout of the present section is therefore as follows: Chapter 1 contains in tabular form the relevant data on length of haul and weight of consignment—the two main influences on modal choice (as revealed in Part I). Chapters 2 through to 7 contain information on the relationship of such factors as the type of commodity, special features attached, price, damage and losses, use of containers or pallets, time taken to deliver, to the distribution of consignments between the various modes. Up to this point the analyses are based mainly on the consignment data, except that use of the subjective assessments has occurred in Chapter 3 and the alternative charges in Chapter 4 are also based on the subjective assessment of the consignor. Finally, in Chapter 8 the influence of ownership of transport facilities on use of modes is assessed.

## Length of haul and consignment weight (the main determinants)

The essence of the probability approach in Part I is that the relative importance of a factor in its influence on manufacturers' distribution of traffic between modes of transport can only be assessed after the influence of all other factors, taken simultaneously, has been considered. Since the factors that influence choice are numerous, consideration of two or three factors at a time, as in a traditional tabular presentation, could therefore give misleading results. Hence the importance of the probability approach. On the other hand, where the influence of a single factor is particularly large it is to be expected that

this influence will also be revealed if the relevant data is set out in tabular form.

Thus, for example, the probability analysis showed short hauls to be the overriding influence on choice of 'C' licensed transport and this can also be clearly demonstrated by expressing the number of consignments carried in each distance bracket as a percentage of the total handled by all modes over that distance, and also by calculating the share of short distance, etc., traffic in the total handled by 'C' vehicles. The relevant figures are given in Tables 1 and 2 below:

Table 1: Share of each mode in total consignments in each distance bracket

|                |          | Percentages       |              |      |        |        |           |                               |
|----------------|----------|-------------------|--------------|------|--------|--------|-----------|-------------------------------|
| Length of haul |          | Mode of transport |              |      |        |        | All modes |                               |
| Over           | Not over | Own road vehicle  | Road haulier | Rail | G.P.O. | Other* | Percent   | No. of consignments in survey |
| 25 miles       | 25 miles | 82                | 8            | 1    | 6      | 3      | 100       | 22,590                        |
| 50 "           | 50 "     | 58                | 15           | 9    | 16     | 1      | 100       | 3,520                         |
| 100 "          | 100 "    | 26                | 33           | 13   | 24     | 1      | 100       | 8,520                         |
| 200 "          | 200 "    | 18                | 35           | 23   | 23     | 1      | 100       | 14,130                        |
| 300 "          | 300 "    | 16                | 33           | 28   | 24     | 1      | 100       | 8,790                         |
| All lengths    |          | 48                | 22           | 12   | 16     | 2      | 100       | 64,350                        |

Source: General Survey.

\* Includes customer collection, coastal shipping, inland waterway, domestic air transport.

Table 2: Shares of short distance, etc transport in total consignments by each mode

|                |          | Percentages       |              |      |        |        |           |                               |
|----------------|----------|-------------------|--------------|------|--------|--------|-----------|-------------------------------|
| Length of haul |          | Mode of transport |              |      |        |        | All modes |                               |
| Over           | Not over | Own road vehicle  | Road haulier | Rail | G.P.O. | Other* | Percent   | No. of consignments in survey |
| 25 miles       | 25 miles | 61                | 12           | 2    | 12     | 19     | 33        | 22,590                        |
| 50 "           | 50 "     | 19                | 11           | 12   | 15     | 12     | 15        | 3,520                         |
| 100 "          | 100 "    | 8                 | 21           | 15   | 21     | 9      | 14        | 8,520                         |
| 200 "          | 200 "    | 8                 | 35           | 42   | 31     | 11     | 23        | 14,130                        |
| 300 "          | 300 "    | 4                 | 26           | 29   | 21     | 9      | 17        | 8,790                         |
| Total          |          | 100               | 100          | 100  | 100    | 100    | 100       | 64,350                        |

Source: General Survey.

\* Includes customer collection, coastal shipping, inland waterway, domestic air transport.



As Table 1 shows, in very short distance transport of up to 25 miles the proportion of consignments carried in 'C' licence vehicles is over 80 per cent and the proportion is also high (nearly 60 per cent) on hauls of between 25 and 50 miles. In medium distance transport of 50 to 100 miles the percentage moved by 'C' vehicles is less than 30 per cent however, while on long hauls of over 100 miles it drops to below 20 per cent. Moreover, the contrast between own account transport and the professional operators in this respect is very marked whichever form of professional operator is considered, but particularly so in the case of the railways. This point is perhaps more clearly brought out by Table 2 which shows that short haul work of less than 25 miles accounts for over 60 per cent of 'C' licence transport (measured in numbers of consignments) compared with 2 per cent of the railways' traffic and 12 per cent of the road hauliers' and the GVO while long hauls of over 100 miles account for 12 per cent of consignments by 'C' vehicles, over 70 per cent of the rail borne movements and over 50 per cent of those handled by hauliers and the GVO.

The competitiveness of the own transport vehicle in the short haul field is also a feature of transport in the U.S.A. As Ol and Hunter point out in their study of 'Economics of Private Truck Transportation': "The T.C. survey provided data which allowed us to test the hypothesis that the use of P.M.T. is positively related to the percentage of the firm's shipments destined to points within a two-hundred mile radius". Tables 5.6 through 5.10 confirm this hypothesis when the effects of firm size and of the number of shipping points are controlled. These results clearly indicate that shipping distance is by far the most powerful explanatory variable for both the incidence and intensity of use of P.M.T.<sup>1</sup>; Also "firms that reported large fractions of their freight movements to nearby destinations, *ceteris paribus*, would be most likely to realise high profitability through the operation of private trucks." Furthermore, "The Sobel Survey confirms the findings based on the T.C. Survey, that P.M.T. is concentrated mainly in short haul traffic."

Moreover, this result of the present survey is perhaps not unexpected. In the Ministry's various studies of the use of road transport, the concentration of 'C' licensed activities on short haul work has been clearly indicated. For example, in the report on the 1962 Road Goods Transport Survey<sup>2</sup>, the tables show that only about ten per cent of tonnage by 'C' licensed vehicles moved on hauls over 90 miles, and using data from the same Survey, the Giddies Report<sup>3</sup> drew attention to the relatively short haul nature of even the larger vehicles operated on own account (paragraph 3.14 Page 27).

Thus, it appears that, contrary to much that has been said in the past,<sup>4</sup> the main reason why own transport is used by industry is its ability to handle short haul traffic better than any other form of transport. As soon as the length of haul moves over about 25 miles, because of numerous factors, such as (in 1966) the legal restrictions on the licence (ie the inability to carry goods other than the trader's own), the lost availability due to the vehicle being away from base for long periods, and so on, the use of own transport falls off sharply.

Consignment weight was shown by the probability analysis to be the second (subject a very poor second) most important influence on choice of 'C' transport and tabulation of the data in conventional fashion displays little concentration in 'C' transport on a particular size of consignment except marginally for consignments of between  $\frac{1}{2}$  ton and 5 tons where the proportion handled by 'C' vehicles rises to over 60 per cent compared with less than 30 per cent in most of the other weight groups (see Table 3). On the other hand, the tabulated data on

consignment weight clearly reveals the influence of this factor on the choice between the professional operators. The preference for GVO parcels service for very light consignments of not over 22 lbs is very apparent and although the road haulier is used rather more than the railways for the carriage of consignments of up to  $\frac{1}{2}$  ton, the difference in their shares of the total of such consignments is not very marked. For larger consignments however the haulier is used much more frequently than the railways and carries 26 per cent of all consignments of between  $\frac{1}{2}$  and 5 tons compared with the railways share of 5 per cent, and about 40 per cent of the consignments over 5 tons compared with 11 per cent handled by the railways.

This greater use of the haulier for the larger consignments is also shown by the distribution of consignments handled by each mode between the different weight categories (Table 4). Nearly 40 per cent of all consignments handled by road hauliers for manufacturing industry weigh over  $\frac{1}{2}$  ton compared with 15 per cent of the railways'. And, taking only the very large consignments of over 5 tons, these account for 15 per cent of the total moved by the haulier compared with 7 per cent of those moved by rail.

Moreover, as the probability analysis showed, length of haul is not a highly significant influence on the choice of road haulage versus rail for a given size of consignment—though the probability of use of rail does increase slightly the greater the haul. This can be displayed in tabular form and Table 5 contains the relevant figures. These show that the haulier's share of total traffic is considerably greater than rail's for all sizes of consignments over  $\frac{1}{2}$  ton and over all distances, but the difference between their respective shares does narrow with increasing length of haul. This is also true of the higher consignments of not over  $\frac{1}{2}$  ton and on hauls over 100 miles rail carries as many of these light consignments as the haulier, while on hauls of over 200 miles rail's share is larger than the haulier's.

Table 5 also displays an interesting feature in the choice between the GVO and other modes for the carriage of small consignments. Whereas the GVO's share approaches 80 per cent on hauls over 25 miles<sup>5</sup> because of the preference for 'C' transport for short hauls, its share drops to just over 30 per cent in the carriage of consignments of not over 22lbs on journeys up to 25 miles. Another factor shown by Table 5 is, where long hauls are involved, the increasing frequency of use of 'C' transport with increasing size of consignment. Own vehicles are used for long hauls of over 100 miles for about 18 per cent of all consignments (see Table 1) but the proportion is 1 per cent for very small consignments, 11 per cent for consignments of 23 lbs to  $\frac{1}{2}$  ton, 37 per cent for consignments weighing between  $\frac{1}{2}$  ton and  $\frac{3}{4}$  tons and about 23 per cent for consignments over  $\frac{3}{4}$  tons—though the number of the latter consignments is relatively small and sampling errors in the estimates therefore rather large.

<sup>1</sup> 'Economics of Private Truck Transportation', Walter Y. Ol and Arthur P. Hunter, the Transportation Centre at North Western University.

<sup>2</sup> *Short haul traffic in the States*.

<sup>3</sup> Conducted for the Ministry of Transport by S. L. Edwards and published by H.M.S.O.

<sup>4</sup> *Carriers' Licensing*.

<sup>5</sup> For example, such factors as speed, certainty of timing, superior service, auxiliary service needed, avoidance of damage or loss, use of specialised vehicles, advertising, etc. have often been put forward as reasons for the use of own road transport vehicles. Although some of these factors may influence choice of mode, as the probability analysis has shown, they are marginal compared to the length of haul criterion.

<sup>6</sup> Undoubtedly the GVO's economy (in respect of distance) charge per lb. contributes to its success in this field but it also offers relatively fast transit and has the best record for freedom from damage and losses (see Chapter 3).

Table 3: Share of each mode in total consignments in each weight group

|             |          | Percentages       |             |      |        |        |           |                               |
|-------------|----------|-------------------|-------------|------|--------|--------|-----------|-------------------------------|
|             |          | Mode of transport |             |      |        |        | All modes |                               |
| Over        | Not over | Own road vehicle  | Road hauler | Rail | G.P.O. | Other* | Percent   | No. of consignments in survey |
| 22 lbs      | 22 lbs   | 17                | 9           | 7    | 65     | 2      | 100       | 18,130                        |
| 112 "       | 112 "    | 35                | 34          | 28   | 1      | 2      | 100       | 14,900                        |
| 560 "       | 560 "    | 44                | 32          | 22   | —      | 2      | 100       | 10,570                        |
| 1120 "      | 1120 "   | 62                | 27          | 7    | —      | 4      | 100       | 3,330                         |
| 1120 "      | 2240 "   | 74                | 20          | 4    | —      | 2      | 100       | 4,410                         |
| 1 ton       | 5 tons   | 63                | 29          | 5    | —      | 3      | 100       | 5,870                         |
| 5 tons      | 7½ "     | 52                | 41          | 4    | —      | 3      | 100       | 1,470                         |
| 7½ "        | 10 "     | 44                | 36          | 15   | —      | 5      | 100       | 1,520                         |
| 10 "        | "        | 37                | 46          | 12   | —      | 5      | 100       | 2,330                         |
| All weights |          | 45                | 22          | 12   | 16     | 2      | 100       | 64,350                        |

Source: General Survey.

\* Includes customer collection, coastal shipping, inland waterway, domestic air transport.

† The group limits 22 lb and 560 lb were used because the former is the parcels limit by G.P.O. services, the latter approximately to the 500 lb limit on passenger train parcels service. Some consignments may be made which are greater than the limit by dividing the consignment into more than one parcel.

Table 4: Consignments in each weight group as a percentage of the total carried by each mode

|        |          | Percentages       |             |      |        |        |           |                               |
|--------|----------|-------------------|-------------|------|--------|--------|-----------|-------------------------------|
|        |          | Mode of transport |             |      |        |        | All modes |                               |
| Over   | Not over | Own road vehicle  | Road hauler | Rail | G.P.O. | Other* | Percent   | No. of consignments in survey |
| 22 lbs | 22 lbs   | 12                | 10          | 14   | 99     | 19     | 28        | 18,130                        |
| 112 "  | 112 "    | 21                | 31          | 45   | 1      | 19     | 23        | 14,900                        |
| 560 "  | 560 "    | 18                | 21          | 26   | —      | 15     | 16        | 10,570                        |
| 1120 " | 1120 "   | 9                 | 6           | 3    | —      | 9      | 6         | 3,330                         |
| 1120 " | 2240 "   | 13                | 5           | 2    | —      | 7      | 7         | 4,410                         |
| 1 ton  | 5 tons   | 17                | 12          | 3    | —      | 14     | 11        | 5,870                         |
| 5 tons | 7½ "     | 3                 | 4           | 1    | —      | 3      | 2         | 1,470                         |
| 7½ "   | 10 "     | 3                 | 4           | 3    | —      | 6      | 3         | 1,520                         |
| 10 "   | "        | 4                 | 7           | 3    | —      | 8      | 4         | 2,330                         |
| Total  |          | 100               | 100         | 100  | 100    | 100    | 100       | 64,350                        |

Source: General Survey.

\* Includes customer collection, coastal shipping, inland waterway, domestic air transport.

Table 5: For four groups of consignment size: Share of each mode in total consignments in each distance bracket

| Percentage     |          |                       |             |      |        |       |                           |             |      |       |                           |             |      |       |                  |             |      |       |    |    |  |
|----------------|----------|-----------------------|-------------|------|--------|-------|---------------------------|-------------|------|-------|---------------------------|-------------|------|-------|------------------|-------------|------|-------|----|----|--|
| Length of haul |          | Weight of consignment |             |      |        |       |                           |             |      |       |                           |             |      |       |                  |             |      |       |    |    |  |
|                |          | Not over 22 lbs       |             |      |        |       | 23 lbs— $\frac{1}{2}$ ton |             |      |       | $\frac{1}{2}$ ton—7½ tons |             |      |       | Over 7½ tons*    |             |      |       |    |    |  |
|                |          | Own road vehicle      | Road hauler | Rail | G.P.O. | Other | Own road vehicle          | Road hauler | Rail | Other | Own road vehicle          | Road hauler | Rail | Other | Own road vehicle | Road hauler | Rail | Other |    |    |  |
| Over           | Not over | 35 m.                 | 25 m.       | 56   | 5      | 1     | 33                        | 5           | 83   | 11    | 2                         | 4           | 84   | 11    | ..               | 5           | 63   | 24    | 4  | 9  |  |
|                |          | 50 m.                 | 50 m.       | 14   | 9      | 4     | 72                        | 1           | 15   | 32    | 31                        | 2           | 33   | 14    | 1                | 2           | 48   | 41    | 1  | 10 |  |
|                |          | 100 m.                | 100 m.      | 2    | 9      | 7     | 82                        | ..          | 30   | 54    | 24                        | 2           | 64   | 29    | 5                | 2           | 51   | 40    | 3  | 6  |  |
|                |          | 100 m.                | 200 m.      | 1    | 11     | 10    | 77                        | 1           | 12   | 44    | 42                        | 2           | 42   | 46    | 10               | 2           | 13   | 61    | 4  | 2  |  |
|                |          | 200 m.                | "           | 1    | 12     | 14    | 72                        | 1           | 9    | 41    | 46                        | 4           | 29   | 56    | 12               | 3           | 15   | 37    | 26 | 2  |  |
| All lengths    |          |                       |             | 17   | 9      | 7     | 65                        | 2           | 39   | 38    | 25                        | 3           | 65   | 27    | 5                | 3           | 40   | 42    | 13 | 5  |  |
|                |          | 100                   |             |      |        |       | 100                       |             |      |       |                           | 100         |      |       |                  |             | 100  |       |    |    |  |

Source: General Survey.

\* Other\* includes customer collection, coastal shipping, inland waterway, domestic air transport and for the weight groups over 22 lbs, G.P.O.

† Because of fewer observations, sampling errors in these estimates are larger than in the estimates for the other weight groups.

Table 5a: Sub-division of the consignment size group  $\frac{1}{2}$  ton- $7\frac{1}{2}$  tons

Percentage

| Length of haul |          | Weight of consignment   |              |      |       |                            |              |      |       |
|----------------|----------|-------------------------|--------------|------|-------|----------------------------|--------------|------|-------|
|                |          | $\frac{1}{2}$ ton-1 ton |              |      |       | 1 ton- $7\frac{1}{2}$ tons |              |      |       |
|                |          | Own road vehicle        | Road haulier | Rail | Other | Own road vehicle           | Road haulier | Rail | Other |
| Over           | Not over |                         |              |      |       |                            |              |      |       |
|                | 25 miles | 60                      | 7            | —    | 3     | 76                         | 15           | —    | 7     |
| 25 miles       | 50 "     | 85                      | 11           | 2    | 2     | 80                         | 18           | 1    | 1     |
| 50 "           | 100 "    | 67                      | 27           | 5    | 1     | 62                         | 30           | 4    | 4     |
| 100 "          | 200 "    | 33                      | 48           | 15   | 4     | 48                         | 43           | 6    | 1     |
| 200 "          | "        | 32                      | 54           | 10   | 4     | 37                         | 57           | 14   | 2     |
| All lengths    |          | 69                      | 23           | 5    | 3     | 62                         | 31           | 4    | 3     |
|                |          | 100                     |              |      |       | 100                        |              |      |       |

Source: General Survey.

'Other' includes customer collection, coastal shipping, inland waterway, domestic air transport and G.P.O.

Table 6: For four groups of consignment size: number of consignments in each distance group as percentage of the total transported by each mode

Percentage

| Length of haul |          | Weight of consignment |              |      |        |       |                           |              |      |       |  |              |      |       |                          |              |      |       |
|----------------|----------|-----------------------|--------------|------|--------|-------|---------------------------|--------------|------|-------|--|--------------|------|-------|--------------------------|--------------|------|-------|
|                |          | Not over 22 lbs       |              |      |        |       | 23 lbs— $\frac{1}{2}$ ton |              |      |       | $\frac{1}{2}$ ton— $7\frac{1}{2}$ tons |              |      |       | Over $7\frac{1}{2}$ tons |              |      |       |
|                |          | Own road vehicle      | Road haulier | Rail | G.P.O. | Other | Own road vehicle          | Road haulier | Rail | Other | Own road vehicle                       | Road haulier | Rail | Other | Own road vehicle         | Road haulier | Rail | Other |
| Over           | Not over |                       |              |      |        |       |                           |              |      |       |  |              |      |       |                          |              |      |       |
| 25 m.          | 25 m.    | 83                    | 13           | 5    | 13     | 79    | 30                        | 11           | 2    | 31    | 48                                     | 15           | 1    | 53    | 32                       | 12           | 5    | 35    |
|                | 50 m.    | 11                    | 15           | 8    | 16     | 30    | 14                        | 18           | 14   | 6     | 18                                     | 7            | 4    | 8     | 31                       | 17           | 2    | 34    |
| 50 m.          | 100 m.   | 3                     | 16           | 16   | 21     | 1     | 8                         | 26           | 15   | 31    | 14                                     | 15           | 15   | 11    | 19                       | 14           | 4    | 17    |
| 100 m.         | 200 m.   | 2                     | 32           | 37   | 31     | 5     | 8                         | 33           | 41   | 12    | 15                                     | 40           | 50   | 18    | 9                        | 38           | 47   | 8     |
| 200 m.         |          | 1                     | 34           | 34   | 29     | 7     | 4                         | 29           | 28   | 20    | 5                                      | 23           | 30   | 10    | 19                       | 19           | 42   | 6     |
| Total          |          | 100                   | 100          | 100  | 100    | 100   | 100                       | 100          | 100  | 100   | 100                                    | 100          | 100  | 100   | 100                      | 100          | 100  | 100   |

Source: General Survey.

'Other' includes customer collection, coastal shipping, inland waterway, domestic air transport and for the weight groups over 22 lbs, G.P.O.

Table 6a: Sub-division of the consignment size group  $\frac{1}{2}$  ton- $7\frac{1}{2}$  tons

Percentage

| Length of haul |          | Weight of consignment   |              |      |       |                            |              |      |       |
|----------------|----------|-------------------------|--------------|------|-------|----------------------------|--------------|------|-------|
|                |          | $\frac{1}{2}$ ton-1 ton |              |      |       | 1 ton- $7\frac{1}{2}$ tons |              |      |       |
|                |          | Own road vehicle        | Road haulier | Rail | Other | Own road vehicle           | Road haulier | Rail | Other |
| Over           | Not over |                         |              |      |       |                            |              |      |       |
|                | 25 miles | 54                      | 13           | —    | 42    | 41                         | 16           | 2    | 62    |
| 25 miles       | 50 "     | 19                      | 7            | 5    | 13    | 17                         | 8            | 3    | 5     |
| 50 "           | 100 "    | 13                      | 15           | 13   | 4     | 16                         | 15           | 16   | 16    |
| 100 "          | 200 "    | 10                      | 42           | 64   | 29    | 23                         | 36           | 36   | 10    |
| 200 "          | "        | 4                       | 23           | 18   | 13    | 5                          | 23           | 43   | 7     |
| Total          |          | 100                     | 100          | 100  | 100   | 100                        | 100          | 100  | 100   |

Source: General Survey.

'Other' includes customer collection, coastal shipping, inland waterway, domestic air transport and G.P.O.

The proportionally greater use of 'C' licence vehicles on the longer hauls when the size of consignment is large is also displayed by Table 6 for four categories of consignment size, and the table clearly demonstrates the importance of long hauls in transport by professional operators whatever the size of the consignment. For example, although the share of movements over 100 miles in 'C' licence transport is 3 per cent where very small consignments are involved, 20 per cent for consignments of  $\frac{1}{2}$  ton to  $7\frac{1}{2}$  tons and nearly 30 per cent for larger consignments, the comparable figures for the railways are 71 per cent, 80 per cent and 89 per cent respectively while those for the road haulier are 56 per cent, 63 per cent and 57 per cent.

The information in Tables 1-6 is based on numbers of consignments. This is one method of measuring the transport generated by industry, but there are other methods, of which the tonnage and ton miles generated are perhaps more widely used. It is not possible from the present survey to give estimates in terms of ton mileages but it is possible to derive some data on the tonnage generated by the establishments covered by the survey and its distribution between the various modes. The information is given in Table 7 which shows the proportion of tonnage in each distance bracket each mode handles. Because of the assumptions that have to be made in deriving estimates of tonnages from numbers of consignments classified by fairly broad weight groups, the figures are rough estimates only but they clearly illustrate the declining share of transport by own vehicles as journey length increases and the increased share of public operators, rail particularly, on the longer hauls.

Table 7: Shares of each mode in total tonnage in each distance group

| Length of haul |          | Percentages       |              |      |        |       | All modes |                   |
|----------------|----------|-------------------|--------------|------|--------|-------|-----------|-------------------|
|                |          | Mode of transport |              |      |        |       |           |                   |
| Over           | Not over | Own road vehicle  | Road haulier | Rail | G.T.O. | Other | Percent   | Tonnage in survey |
|                | 25 miles | 72                | 18           | 3    | —      | 7     | 100       | 18,900            |
| 25 miles       | 50 "     | 57                | 33           | 2    | —      | 8     | 100       | 12,450            |
| 50 "           | 100 "    | 57                | 35           | 3    | —      | 5     | 100       | 12,000            |
| 100 "          |          | 29                | 50           | 19   | —      | 2     | 100       | 36,400            |
| All lengths    |          | 48                | 38           | 10   | —      | 4     | 100       | 79,700            |

Source: General Survey

## Type of commodity

Type of commodity, it is often suggested, has a marked influence on choice of mode of transport and although the tabulated data suggests this factor to be an important influence on use of 'C' transport, with a very marked concentration on own transport occurring in the carriage of foodstuffs and building materials (see Table 8) and such traffic accounting for over half of all consignments moved for manufacturing industry by 'C' vehicles (Table 9), the tabulations are in this instance deceptive since, as the probability analysis showed, it is not the com-

modity as such that is important but the short hauls which are a marked feature of the movements of foodstuffs and building materials. The influence of commodity is also not very great in the case of the professional operators except, as Table 8 shows, where carriage of chemicals and electrical goods are involved for which a relatively heavy concentration on road haulage and G.P.O. parcels services occurred, and in the carriage of iron and steel where there was some concentration on rail transport.

Table 8: Share of each mode in total consignments in each commodity group

| Commodity           | Percentage        |                     |              |      |        |        | All modes |                               |
|---------------------|-------------------|---------------------|--------------|------|--------|--------|-----------|-------------------------------|
|                     | Mode of transport |                     |              |      |        |        | Percent   | No. of consignments in survey |
|                     | Own road vehicle  | Customer collection | Road haulier | Rail | G.P.O. | Other* |           |                               |
| Foodstuffs          | 92                | 1                   | 4            | 3    | —      | —      | 100       | 15,410                        |
| Crude materials     | 25                | 8                   | 36           | 24   | 7      | —      | 100       | 2,090                         |
| Chemicals           | 15                | 3                   | 42           | 3    | 37     | —      | 100       | 4,690                         |
| Building materials  | 69                | 10                  | 18           | 3    | —      | —      | 100       | 5,660                         |
| Iron and steel      | 20                | 3                   | 28           | 32   | 17     | —      | 100       | 1,730                         |
| Non-ferrous metals  | 46                | 1                   | 15           | 7    | 25     | 4      | 100       | 930                           |
| Electrical goods    | 15                | 1                   | 36           | 17   | 31     | —      | 100       | 3,020                         |
| Transport equipment | 41                | 2                   | 30           | 15   | 15     | —      | 100       | 2,620                         |
| Metal manufactures  | 27                | 1                   | 24           | 13   | 35     | —      | 100       | 2,970                         |
| Other manufactures  | 30                | 1                   | 27           | 16   | 21     | —      | 100       | 26,330                        |
| Other commodities†  | 38                | 3                   | 19           | 5    | 34     | 1      | 100       | 989                           |
| All industries      | 48                | 2                   | 22           | 12   | 16     | —      | 100       | 64,390                        |

Source: General Survey.

\* Includes coastal shipping, inland waterway, domestic air transport.

† Includes consignments where commodity not stated.

Thus, although the type of commodity does not have a marked effect on choice of mode, since the commodities generated by manufacturing plants are a proxy for the type of industry involved, the detailed information on consignments of various commodities provides a useful insight into the use of transport modes by different industries. Ten groups of commodities were distinguished in the General Survey and five narrowly defined industries were covered by the Commodity Survey, a brief account of the use of transport by each of these groups is given in the sections that follow. The treatment is descriptive and no attempt is made to assess the determinants of demand for each mode in each industry, but, as will be seen, the importance of such determinants as length of haul and consignment weight will continuously emerge from the analysis, while in those (few) cases where type of commodity has a significant influence

on modal choice (eg rail for iron and steel, road haulage for chemicals) this will also be seen from the tabulations.

### (a) Foodstuffs

The foodstuffs group of commodities covers both raw and processed foods, but in the present survey, since only outwards consignments from food processing industries have been covered, most of these commodities consist of processed foods. Also, for a better understanding of the nature of the consignments of this industry it should be noted that a high proportion of the movements would probably be from processing plants direct to retail outlet. Some inter-plant movements obviously occur because, for example, the commodity group includes flour which would move mainly from the mill to bread or bes-

Table 9: Shares of various commodities in total transport by each mode

| Commodity           | Mode of transport |                     |             |      |        |        | All modes |                               |
|---------------------|-------------------|---------------------|-------------|------|--------|--------|-----------|-------------------------------|
|                     | Own road vehicle  | Customer collection | Road hauler | Rail | G.P.O. | Other* | Percent   | No. of consignments in survey |
| Foodstuffs          | 49                | 12                  | 5           | 6    | —      | —      | 25        | 16,400                        |
| Crude materials     | 2                 | 13                  | 5           | 6    | 1      | 4      | 3         | 1,000                         |
| Chemicals           | 2                 | 11                  | 12          | 1    | 15     | 3      | 6         | 4,000                         |
| Building materials  | 8                 | 31                  | 5           | 1    | —      | 1      | 6         | 3,600                         |
| Iron and steel      | 1                 | 4                   | 3           | 7    | 3      | 6      | 3         | 1,700                         |
| Non-ferrous metals  | 1                 | 1                   | 1           | 1    | 2      | 19     | 1         | 900                           |
| Electrical goods    | 2                 | 3                   | 8           | 7    | 9      | 3      | 5         | 3,000                         |
| Transport equipment | 3                 | 5                   | 6           | 4    | 4      | 3      | 4         | 2,600                         |
| Metal manufactures  | 3                 | 3                   | 3           | 5    | 10     | 6      | 5         | 2,900                         |
| Other manufactures  | 28                | 15                  | 49          | 62   | 54     | 53     | 43        | 26,300                        |
| Other commodities†  | 1                 | 2                   | 1           | —    | 2      | 3      | 1         | 500                           |
| Total               | 100               | 100                 | 100         | 100  | 100    | 100    | 100       | 64,300                        |

Source: General Survey.

\* Includes coast shipping, inland waterway, domestic air transport.

† Includes consignments where commodity not stated.

cant factories, and there are also movements from processing plants to regional warehouses or wholesale distribution centres, but in the main the distribution structure of many parts of the food and drink industry is such that many consignments probably flow direct to the shops or public houses.

Given this type of activity it is perhaps not surprising that the use of transport is overwhelmingly of own account road transport and also that consignment size is predominantly very small and length of haul very short. The analysis of consignment by mode, size and length reveals that own vehicles are relatively speaking rarely used for hauls over 50 miles or for consignments over 5 tons. The medium and longer hauls and the heavier consignments form a greater proportion of the work of the haulier and the very heavy and very long distance consignments from the greatest proportion of rail borne movements (see Tables 10 and 11). Indeed, taking only those consignments of over 5 tons, even in terms of the absolute number handled, more were moved by the road hauler over distances of 100 to 200 miles than were carried by own vehicles and more were handled by the railways over distances over 300 miles. (Consignments smaller than 5 tons are sent over distances up to 300 miles however and these are carried mainly by own transport so that if all sizes of consignments are taken, transport on own account handles more than rail or public haulier combined over all distances up to 300 miles).

Moving onto the Commodity Survey, which includes a section of the food and drink industry, the results show that although the percentage of consignments shipped by own transport in that branch of the food industry studied is not so high as in the whole range of food and drink industries in the General Survey (70 per cent compared with 90 per cent), the same concentration of use of own transport for light consignments and over short distances is clearly indicated. When consignments of over five tons are involved the road haulier is mainly used irrespective of the distance involved, ie, short as

well as medium and long hauls while the railways are relatively little used except for long hauls of over 300 miles where they move about the same number of consignments as the haulier.

Table 10: Distribution of consignments of foodstuffs by size and mode of transport

| Size                |          | Mode of transport   |             |      |        | All modes |              |
|---------------------|----------|---------------------|-------------|------|--------|-----------|--------------|
|                     |          | Own road vehicle    | Road hauler | Rail | Other* | Percent   | No. of cons. |
| Over                | Not over |                     |             |      |        |           |              |
| 22 lbs              | 22 lbs   | —                   | —           | —    | —      | 25        | 9,100        |
| 112 "               | 112 "    | 57                  | 7           | 7    | 1      | —         | —            |
| 500 "               | 500 "    | 13                  | 13          | 10   | —      | —         | —            |
| 1120 "              | 1120 "   | 7                   | 9           | 1    | —      | —         | 1,350        |
| 5 tons              | 5 tons   | 14                  | 7           | 1    | 4      | 12        | 2,100        |
| 10 tons             | 10 tons  | 16                  | 25          | 10   | 47     | 16        | 2,600        |
| 5 tons              | 5 tons   | 1                   | 12          | —    | 15     | 2         | 300          |
| 7½ "                | 7½ "     | 2                   | 4           | 38   | 19     | 3         | 450          |
| 10 "                | 10 "     | 3                   | 19          | 33   | 14     | 5         | 750          |
| All sizes           |          | 100                 | 100         | 100  | 100    | 100       |              |
| No. of consignments |          | 15,130 <sup>2</sup> | 680         | 460  | 140    |           | 16,400       |

Source: General Survey. Figures are grossed from a sample of 1,339 consignments.

<sup>2</sup> Number of consignments with weight not stated was relatively large. These could be distributed between the size classes in the proportions shown by the consignments for which the information was given, but, more realistically, the unknowns have been allocated to the weight groups up to 500 lbs only.

\* Consists mainly of customer collection.

Table 11: Distribution of consignments of foodstuffs by lengths of haul and mode of transport

|                |          | Percentage        |              |      |       |           |              |
|----------------|----------|-------------------|--------------|------|-------|-----------|--------------|
| Length of haul |          | Mode of transport |              |      |       | All modes |              |
| Over           | Not over | Own road vehicle  | Road haulier | Rail | Other | Per cent  | No. of cons. |
| 25 miles       | 25 miles | 61                | 11           | 2    | 80    | 57        | 9,400        |
| 50 "           | 50 "     | 25                | 11           | 1    | —     | 23        | 3,743        |
| 75 "           | 75 "     | 3                 | 2            | —    | 4     | 3         | 452          |
| 100 "          | 100 "    | 3                 | 5            | 1    | 4     | 3         | 580          |
| 125 "          | 125 "    | 3                 | 12           | 13   | 7     | 4         | 635          |
| 150 "          | 150 "    | 1                 | 25           | 6    | —     | 2         | 456          |
| 200 "          | 200 "    | 2                 | 15           | 12   | —     | 3         | 436          |
| 300 "          | 300 "    | 2                 | 12           | 33   | 5     | 4         | 590          |
| 400 "          | 400 "    | —                 | 7            | 32   | —     | 1         | 200          |
| All lengths    |          | 100               | 100          | 100  | 100   | 100       | 16,416       |

Source: General Survey.

Table 12a: Distribution of consignments in the bacon curing etc industry (M.E.H. 214 and 215) by size and mode of transport

|                     |            | Percentage        |              |      |                    |           |              |
|---------------------|------------|-------------------|--------------|------|--------------------|-----------|--------------|
| Size                |            | Mode of transport |              |      |                    | All modes |              |
| Over                | Not over   | Own road vehicle  | Road haulier | Rail | Other <sup>1</sup> | Per cent  | No. of cons. |
| 22 lbs              | 22 lbs     | 40                | 3            | 15   | 35                 | 31        | 7,000        |
| 112 "               | 112 "      | 25                | 7            | 41   | —                  | 25        | 5,640        |
| 560 "               | 560 "      | 19                | 13           | 23   | 45                 | 18        | 4,070        |
| 1120 "              | 1120 "     | 4                 | 19           | 1    | 1                  | 7         | 1,580        |
| 2240 "              | 2240 "     | 3                 | 13           | 5    | 1                  | 5         | 1,130        |
| 1 ton               | 5 tons     | 6                 | 21           | 6    | 30                 | 9         | 2,050        |
| 5 tons              | 7 1/2 tons | —                 | 7            | —    | 1                  | 1         | 230          |
| 7 1/2 tons          | 10 "       | —                 | 3            | 2    | 2                  | 1         | 230          |
| 10 "                | —          | —                 | 12           | 7    | 1                  | 3         | 670          |
| All sizes           |            | 100               | 100          | 100  | 100                | 100       |              |
| No. of consignments |            | 15,400            | 6,250        | 530  | 220                |           | 22,500       |

Source: Commodity Survey. Figures are based on a sample of 2,440 consignments.

<sup>1</sup> Includes customer collection, G.P.O., coast shipping and 'other' transport.

The picture yielded by the consignment data for the bacon curing etc industry may at first glance seem to be at variance with that presented by the *tonnage* data for this industry (see Table 91, Page 82) but if the number of consignments in each size grouping is given its respective weight (ie multiplied by the mid-point of the group) the result, which represents the consignment data translated into the total tonnage involved, accords very closely with the proportion handled by each mode as set out in the latter table, which, incidentally, covers outward and inward traffic whereas the consignment data applies to outwards only.

Table 12b: Distribution by length of haul

|                |          | Percentage        |              |      |       |           |              |
|----------------|----------|-------------------|--------------|------|-------|-----------|--------------|
| Length of haul |          | Mode of transport |              |      |       | All modes |              |
| Over           | Not over | Own road vehicle  | Road haulier | Rail | Other | Per cent  | No. of cons. |
| 25 miles       | 25 miles | 58                | 18           | 5    | 18    | 45        | 10,150       |
| 50 "           | 50 "     | 18                | 23           | 15   | 13    | 19        | 4,300        |
| 75 "           | 75 "     | 9                 | 5            | 30   | 18    | 8         | 1,800        |
| 100 "          | 100 "    | 4                 | 2            | 29   | 3     | 4         | 900          |
| 125 "          | 125 "    | 3                 | 3            | 2    | 4     | 3         | 680          |
| 150 "          | 150 "    | 3                 | 4            | 17   | 4     | 3         | 680          |
| 200 "          | 200 "    | 3                 | 1            | 1    | 36    | 3         | 680          |
| 300 "          | 300 "    | —                 | 42*          | 5    | 5     | 14        | 3,160        |
| 400 "          | 400 "    | —                 | 2            | 18   | 1     | 1         | 230          |
| All lengths    |          | 100               | 100          | 100  | 100   | 100       | 22,580       |

\* Because this figure is mostly dependent on a few consignments with a large grossing factor, the sampling error in the estimate is very large. Excluding the latter consignments the figure would be 5 percent, which is probably a more realistic estimate.

## (b) Crude materials

This group of commodities is a very mixed one and cannot readily be equated with the output of each industry involved.\* Moreover, the number of observations available for this group is fairly limited so that the number in any particular cell is small and, given the same degree of variability in the data, the sampling errors in the figures tend, therefore, to be larger than in those commodity groups where the number of observations is much bigger.

Nevertheless, the broad picture that emerges about the use of various means of transport for the carriage of crude materials yields useful information and from the checks that can be made on the data by reference to other sources, the pattern is what one might expect. For example, as Table 13 shows, each of the main modes of transport share fairly equally in the carriage of consignments of crude materials. The railways are predominant in the carriage of the larger consignments of over 7 1/2 tons, a high proportion of which involved the movement of solid fuel—probably manufactured fuels since coal mines were excluded from the survey. Transport on own account is used mainly for medium sized consignments of between 1 and 7 1/2 tons, and the road haulier for the smaller consignments.

Analysis by length of haul shows a concentration of 'C' items work on very short hauls, the road haulier handling consignments over all distances up to 300 miles in fairly equal proportions, and the railways the principal carrier of consignments over 150 miles.

\* Given the scope of the enquiry, apart from the manufactured fuels carried by the railways, the type of products involved would mainly be, however, manufactured fertilisers, derivatives of animals and vegetable oils and fats, synthetic rubber and artificial and synthetic textile fibres. As the first three products are outputs of industries classified to the chemicals and allied group, most of the crude materials carried by road vehicles could therefore be classified to the chemicals industry.

**Table 13: Distribution of consignments of crude materials by size and mode of transport**

|                     |          | Percentages       |              |      |                    |          |              |           |
|---------------------|----------|-------------------|--------------|------|--------------------|----------|--------------|-----------|
|                     |          | Mode of transport |              |      |                    | Per cent | No. of cons. | All modes |
| Size                |          | Own road vehicle  | Road haulier | Rail | Other <sup>a</sup> |          |              |           |
| Over                | Not over |                   |              |      |                    |          |              |           |
| 22 lbs              | 22 lbs   | —                 | 3            | 11   | 47                 | 11       | 239          |           |
| 112 "               | 112 "    | 9                 | 42           | 44   | 24                 | 33       | 679          |           |
| 500 "               | 500 "    | 18                | 25           | 3    | 10                 | 16       | 329          |           |
| 1120 "              | 1120 "   | 15                | 12           | —    | 5                  | 8        | 170          |           |
| 2240 "              | 2240 "   | 30                | 8            | —    | 7                  | 6        | 130          |           |
| 3 tons              | 3 tons   | 30                | 3            | —    | 7                  | 7        | 150          |           |
| 5 tons              | 5 tons   | 20                | 2            | —    | 10                 | 3        | 60           |           |
| 7 1/2 "             | 10 "     | —                 | —            | 10   | —                  | 6        | 190          |           |
| 10 "                | 10 "     | —                 | 1            | 23   | —                  | —        | —            |           |
| All sizes           |          | 100               | 100          | 100  | 100                | 100      | —            |           |
| No. of consignments |          | 510               | 780          | 480  | 330                | —        | 2,050        |           |

Source: General Survey. Figures are grossed from a sample of 700 consignments.

<sup>a</sup> Includes courier collection and G.P.O. delivery.

**Table 14: Distribution of consignments of crude materials by length of haul and mode of transport**

|                |          | Percentages       |              |      |       |          |              |           |
|----------------|----------|-------------------|--------------|------|-------|----------|--------------|-----------|
|                |          | Mode of transport |              |      |       | Per cent | No. of cons. | All modes |
| Length of haul |          | Own road vehicle  | Road haulier | Rail | Other |          |              |           |
| Over           | Not over |                   |              |      |       |          |              |           |
| 25 miles       | 25 miles | 46                | 11           | 10   | 40    | 25       | 510          |           |
| 25 miles       | 50 "     | 2                 | 12           | 3    | 7     | 7        | 840          |           |
| 50 "           | 75 "     | 6                 | 16           | 8    | 10    | 10       | 210          |           |
| 75 "           | 100 "    | 21                | 13           | 10   | 5     | 14       | 250          |           |
| 100 "          | 125 "    | 3                 | 7            | 11   | 7     | 7        | 140          |           |
| 125 "          | 150 "    | 6                 | 13           | 15   | 2     | 10       | 200          |           |
| 150 "          | 200 "    | 10                | 13           | 20   | 11    | 13       | 270          |           |
| 200 "          | 300 "    | 6                 | 15           | 23   | 12    | 14       | 290          |           |
| 300 "          | 300 "    | —                 | —            | —    | 3     | —        | 10           |           |
| All lengths    |          | 100               | 100          | 100  | 100   | 100      | 2,050        |           |

Source: General Survey.

### (c) Chemicals

The chemicals group of commodities is an extremely heterogeneous group reflecting the diversity of the industries included in 'chemicals and allied industries' (see Order IV, excluding mineral oil refining), and this results in a very complex pattern of demand for transport. Also, the consequent variability in the data leads to large sampling errors so that the results of the General Survey are of limited value in examining the allocation of transport demand for this industry.

However the figures, for what they are worth, are presented in Tables 15 and 16 and they show that unlike many other industries, transport on own account in the chemical industry is

not confined to the carriage of small consignments; very heavy consignments of ten tons or more are handled fairly frequently by own transport vehicles. Moreover, whereas there is some concentration on the shorter distance traffic, movements of 100 to 300 miles are almost as frequently undertaken by transport on own account in this industry.

The road haulier is also used for large consignments and for long hauls and indeed the haulier is the main means of transport used by the industry,\* handling almost three times as many consignments as vehicles operated on own account and substantially more than the railways, which were rarely used and then only for fairly small consignments on very long hauls.

The principal carrier of very small consignments was the G.P.O. and the number of such movements was so large as to make the G.P.O. second to the haulier in numbers of consignments carried. Consignments by this mode were sent over all distances but predominantly in the 25 to 100 mile range.

**Table 15: Distribution of consignments of chemicals by size and mode of transport**

|                     |          | Percentages       |              |      |                    |          |              |           |
|---------------------|----------|-------------------|--------------|------|--------------------|----------|--------------|-----------|
|                     |          | Mode of transport |              |      |                    | Per cent | No. of cons. | All modes |
| Size                |          | Own road vehicle  | Road haulier | Rail | Other <sup>a</sup> |          |              |           |
| Over                | Not over |                   |              |      |                    |          |              |           |
| 22 lbs              | 22 lbs   | 3                 | 3            | 3    | 92                 | 40       | 1,600        |           |
| 112 "               | 112 "    | 14                | 12           | 15   | 3                  | 8        | 320          |           |
| 500 "               | 500 "    | 19                | 12           | 96   | 3                  | 11       | 400          |           |
| 1120 "              | 1120 "   | 9                 | 3            | 6    | 1                  | 3        | 130          |           |
| 2240 "              | 2240 "   | 7                 | 9            | 5    | —                  | 5        | 190          |           |
| 3 tons              | 3 tons   | 7                 | 15           | 5    | —                  | 8        | 210          |           |
| 5 tons              | 5 tons   | 20                | 3            | —    | —                  | 4        | 180          |           |
| 7 1/2 "             | 10 "     | 1                 | 10           | —    | —                  | 4        | 180          |           |
| 10 "                | 10 "     | 20                | 31           | —    | 3                  | 17       | 710          |           |
| All sizes           |          | 100               | 100          | 100  | 100                | 100      | —            |           |
| No. of consignments |          | 660               | 1,710        | 100  | 1,640              | —        | 4,060        |           |

Source: General Survey. Figures are grossed from a sample of 290 consignments.

<sup>a</sup> Includes G.P.O. mainly, some courier collection.

The above general comments are the most that can be drawn from the data yielded by the General Survey but the Commodity Survey also included a section of the chemical industry and reference to this survey will enable a more detailed assessment to be made of the use of the various transport media by a part of the chemical and allied industry complex.

The section covered by the Commodity Survey was the heavy chemicals and dyestuffs industry (SIC 271). This is a fairly homogeneous group of activities but it is so markedly different from other sections of the industry, for example, the pharmaceutical section, the plastics materials section, etc. that the results that emerge can only be said to apply to the section under study; they must not be assumed to apply to (a) the industry taken as a whole (for which the General Survey results, rough as they are, provide a better indicator) or (b) other sections, particularly those producing for final demand.

\* The predominance of road haulage in the chemicals and allied industries is such that the group of commodities classified as 'chemicals' is a significant factor, other factors considered (eg length of haul, weight, etc), in choice between road haulier and rail (see Part I, p. 22).



Table 16: Distribution of consignments of chemicals by length of haul and mode of transport

| Length of haul |          | Mode of transport |              |      |       | All modes |              |
|----------------|----------|-------------------|--------------|------|-------|-----------|--------------|
|                |          | Own road vehicle  | Road haulier | Rail | Other | Per cent  | No. of cons. |
| Over           | Not over |                   |              |      |       |           |              |
| 25 miles       | 25 miles | 27                | 2            | —    | 3     | 6         | 250          |
| 25 miles       | 50 "     | 26                | 9            | —    | 25    | 20        | 790          |
| 50 "           | 75 "     | 4                 | 10           | 1    | 28    | 16        | 670          |
| 75 "           | 100 "    | 2                 | 5            | 30   | 3     | 6         | 250          |
| 100 "          | 125 "    | 12                | 4            | 5    | 7     | 7         | 270          |
| 125 "          | 150 "    | 3                 | 4            | 5    | 2     | 4         | 160          |
| 150 "          | 200 "    | 13                | 25           | 65   | 6     | 30        | 110          |
| 200 "          | 300 "    | 12                | 27           | 7    | 14    | 19        | 760          |
| 300 "          |          | 1                 | 4            | 6    | 1     | 2         | 300          |
| All lengths    |          | 100               | 100          | 100  | 100   | 100       | 4,600        |

Source: General Survey.

Some 38,000 consignments were covered in the enquiry into the transport usage of the heavy chemicals industry and as Table 18a shows, own account road transport, road haulage and the railways were evenly used, each carrying about 10,000 consignments.\* The GVO was also used fairly frequently (for nearly 6,000 consignments) while the remaining 2,000 movements covered by the survey were mainly carried in customers' own vehicles. Coastal shipping and inland waterways were rarely used but it should be remembered that the consignment data relates to outward movements from chemical plants; inland waterway transport, for example, is used very largely for inward movement only and the same is probably true of coastal shipping.

Although each of the three main forms of inland transport are used in equal proportions, there is a considerable difference in the type of consignment each carries. Own road vehicles are used mainly for light consignments of between 22 and 560 lbs; such consignments accounting for a half of all those handled by these vehicles.† On the other hand, use of 'C' vehicles for larger consignments of up to 5 tons is not infrequent while nearly a tenth of the total consignments they handled were over 10 tons. In the case of the larger consignments the distance factor is rather important however. There appears to be a marked cut-off point at the 150 mile mark, for on those journeys made by 'C' vehicles in excess of this distance, carriage of consignments heavier than 560 lbs was most infrequent. For example, in the distance bracket 150 to 300 miles, 80 per cent of consignments weighed less than 560 lbs, and over 90 per cent weighed less than 1 ton. A second, though less marked, cut-off point occurs at the 75 mile mark; above this distance few consignments weighing more than 5 tons are carried by own account transport (about 30 per cent compared with 70 per cent carried under that distance).

The road haulier is used for carriage over all distances up to 300 miles and for all sizes of consignments except very light

ones of less than 22 lbs. There is some concentration in the size ranges over a ton, however, since two thirds of consignments sent by the haulier weighed more than a ton compared with about a third of those sent by rail or own transport.‡

British Railways tend to be mainly used partly for those consignments in the 22 lbs to 560 lbs range which were not carried by own account transport and partly for large consignments of over 7½ tons. There is no clear reason why rail is used instead of 'C' licence transport for the small consignments except that there is a distinct preference for rail for hauls over 300 miles and for own transport for hauls less than 50 miles; in between, rail and own transport are used about equally. For the larger consignments rail is used as an alternative to the road haulier. Some 4,400 consignments over 5 tons were despatched by the industry by road haulier and some 2,600 by rail, compared with 1,400 by own road vehicle. A feature of the ones sent by the haulier was their distribution over all distances up to 300 miles but with some concentration on the short hauls, while a greater proportion of the rail borne ones were in the 150 mile plus distance bracket. This suggests a slight tendency to use rail more for the medium distance hauls and a stronger tendency for its use for the long hauls of over 150 miles. Table 17 gives the relevant figures.

Table 17: Use of road haulier, rail and own road vehicle for consignments over 5 tons in the heavy chemical industry

| Length of haul |          | Road haulier        |     | Rail                |     | Own vehicle         |     |
|----------------|----------|---------------------|-----|---------------------|-----|---------------------|-----|
|                |          | No. of consignments | %   | No. of consignments | %   | No. of consignments | %   |
| Over           | Not over |                     |     |                     |     |                     |     |
|                | 75 miles | 2,316               | 52  | 1,044               | 40  | 946                 | 70  |
| 75 miles       | 150 "    | 597                 | 22  | 652                 | 25  | 323                 | 24  |
| 150 "          |          | 1,140               | 26  | 933                 | 35  | 85                  | 6   |
| All lengths    |          | 4,443               | 100 | 2,629               | 100 | 1,352               | 100 |

Source: Commodity Survey.

The GVO was used exclusively for small consignments of 22 lbs or less and in the carriage of these consignments the GVO was the predominant mode used—own transport being rarely used (unlike in the food industry studied\*). Hauls were over all distances but with a marked concentration on the longer distances of over 125 miles.

The customers themselves sometimes collected consignments from chemical plants in their own vehicles. Normally such consignments were very large (over 7½ tons) and the distance involved was rarely over 200 miles and mainly less than 75 miles.

\* The cost of design, in respect of distance, for consigning by GVO probably obviates this form of transportation a very competitive one for movements over about 100 miles. Below that distance (and more definitely below 50 miles), assuming some haulage possible, own vehicle is probably the cheapest if not cheaper. Hence one of the reasons for the difference in allocation of these small consignments between transport modes in the food-stuffs via a via the heavy chemical industry; in the former length of haul small consignments were predominantly below 50 miles, in the latter they were mainly over 300 miles.

\* The size bias in the establishment sample may be overrating the importance of the railways in the heavy chemicals industry however.

† These findings are also clear from the probability analysis in Part I, which shows consignment size to be a significant factor (though a minor one) other factors considered, in the choice between road haulier and own transport.

Table 18a: Distribution of consignments in the heavy chemicals industry (MLH 271) by size and mode of transport

|                     |          | Percentages       |             |        |                     |        |           |                     |
|---------------------|----------|-------------------|-------------|--------|---------------------|--------|-----------|---------------------|
|                     |          | Mode of transport |             |        |                     |        | All modes |                     |
| Size                |          | Own road vehicle  | Road hauler | Rail   | Customer collection | G.P.O. | Percent   | No. of consignments |
| Over                | Not over |                   |             |        |                     |        |           |                     |
| 22 lbs              | 22 lbs   | 6                 | 1           | 5      | —                   | 100    | 19        | 7,380               |
| 112 "               | 112 "    | 30                | 30          | 24     | 2                   | —      | 15        | 5,740               |
| 112 "               | 560 "    | 33                | 15          | 21     | 2                   | —      | 18        | 6,920               |
| 560 "               | 1120 "   | 7                 | 4           | 7      | —                   | —      | 5         | 1,850               |
| 1120 "              | 2240 "   | 9                 | —           | 6      | 1                   | —      | 5         | 2,080               |
| 1 ton               | 3 tons   | 14                | 22          | 11     | 6                   | —      | 13        | 5,020               |
| 3 tons              | 7½ "     | 4                 | 9           | 2      | 9                   | —      | 4         | 1,630               |
| 7½ "                | 30 "     | 2                 | 12          | 9      | 27                  | —      | 7         | 2,590               |
| 10 "                |          | 8                 | 22          | 15     | 57                  | —      | 14        | 5,450               |
| All sizes           |          | 100               | 100         | 100    | 100                 | 100    | 100       | —                   |
| No. of consignments |          | 10,350            | 10,420      | 10,130 | 1,290               | 5,730  |           | 38,500              |

Source: Commodity Survey. Figures are based on a sample of 3,968 consignments.

\* Including 380 consignments by coastal shipping and "other" transport.

Table 18b: Distribution by length of haul

|                |          | Percentages       |             |      |                     |        |           |                     |
|----------------|----------|-------------------|-------------|------|---------------------|--------|-----------|---------------------|
|                |          | Mode of transport |             |      |                     |        | All modes |                     |
| Length of haul |          | Own road vehicle  | Road hauler | Rail | Customer collection | G.P.O. | Percent   | No. of consignments |
| Over           | Not over |                   |             |      |                     |        |           |                     |
| 25 miles       | 25 miles | 17                | 16          | 1    | 13                  | 11     | 11        | 4,260               |
| 50 "           | 50 "     | 30                | 28          | 14   | 20                  | 11     | 19        | 7,280               |
| 50 "           | 75 "     | 9                 | 10          | 9    | 18                  | 4      | 9         | 3,600               |
| 75 "           | 100 "    | 6                 | 6           | 4    | 9                   | 1      | 5         | 1,960               |
| 100 "          | 125 "    | 6                 | 9           | 9    | 6                   | 1      | 7         | 2,640               |
| 125 "          | 150 "    | 9                 | 8           | 9    | 9                   | 20     | 10        | 3,030               |
| 150 "          | 200 "    | 10                | 16          | 18   | 18                  | 9      | 17        | 6,380               |
| 200 "          | 300 "    | 13                | 16          | 15   | 7                   | 28     | 17        | 6,720               |
| 300 "          |          | —                 | 1           | 10   | —                   | 15     | 5         | 2,030               |
| All lengths    |          | 100               | 100         | 100  | 100                 | 100    | 100       | 18,300              |

Source: Commodity Survey.

**(d) Building materials**

The building materials industry, like the foodstuffs industry, produces mainly for points of final consumption (in this case the construction industry) and therefore, again as in the foodstuffs industry, it is perhaps not surprising that such a high proportion of its transport is catered for by vehicles operated on own account—some 70 per cent of total consignments were sent by this mode. Moreover, there is a further similarity with the foodstuffs industry in that a very high proportion of consignments move over very short distances, for which, as seems to be emerging from this report, there is no major alternative to own account road transport. (Nearly 90 per cent of consignments despatched by both of these heavy users of 'C' vehicles moved on hauls of less than 50 miles). There is one distinct dissimilarity with the foodstuffs industry however, and this relates to the size of consignment sent by 'C' vehicle; in the latter industry a very high proportion weighed less than 560 lbs but

in the building materials industry, as might be expected from the nature of the product, there were quite a number of heavy consignments despatched by own account transport, for example, over a fifth were greater than 7½ tons. Few of these large consignments were hauled more than 75 miles however.

The road hauler is used mainly for the larger consignments of over about 5 tons. Most (over 70 per cent) of these were hauled over short distances of up to about 50 miles but the remainder were scattered over all distances from 50 to 300 miles and more. In general, the hauler is used more than own transport for the longer hauls of over 100 miles for consignments of all sizes. The railways, though rarely used by the industry, carried most of the small consignments of between 22 and 560 lbs moving over distances greater than 150 miles. Customer collection was fairly common but it was usually over very short distances of less than 25 miles. As might be expected, the building materials industry rarely uses G.P.O. services.

**Table 19: Distribution of consignments of building materials by size and mode of transport**

|                     |          | Percentages       |              |      |                    |           |              |
|---------------------|----------|-------------------|--------------|------|--------------------|-----------|--------------|
|                     |          | Mode of transport |              |      |                    | All modes |              |
| Size                |          | Own road vehicle  | Road haulier | Rail | Other <sup>1</sup> | Per cent  | No. of cons. |
| Over                | Not over |                   |              |      |                    |           |              |
| 22 lbs              | 22 lbs   | 2                 | —            | —    | 26                 | 6         | 168          |
| 22 "                | 112 "    | 21                | 2            | 42   | 14                 | 18        | 648          |
| 112 "               | 560 "    | 24                | 2            | 37   | 13                 | 19        | 706          |
| 560 "               | 1120 "   | 8                 | 4            | 1    | 17                 | 8         | 306          |
| 1120 "              | 2240 "   | 6                 | 7            | 6    | 4                  | 6         | 246          |
| 1 ton               | 5 tons   | 13                | 18           | 13   | 3                  | 13        | 495          |
| 3 tons              | 7½ "     | 5                 | 12           | —    | 4                  | 6         | 220          |
| 7½ "                | 10 "     | 15                | 26           | 1    | 12                 | 24        | 670          |
| 10 "                |          | 6                 | 19           | —    | 7                  | 8         | 310          |
| All sizes           |          | 100               | 100          | 100  | 100                | 100       | —            |
| No. of consignments |          | 3,518             | 670          | 90   | 260                | —         | 3,660        |

Source: General Survey. Figures are grossed from a sample of 878 consignments.

<sup>1</sup> Includes customer collection mainly.

**Table 20: Distribution of consignments of building materials by length of haul and mode of transport**

|                |          | Percentages       |              |      |       |           |              |
|----------------|----------|-------------------|--------------|------|-------|-----------|--------------|
|                |          | Mode of transport |              |      |       | All modes |              |
| Length of haul |          | Own road vehicle  | Road haulier | Rail | Other | Per cent  | No. of cons. |
| Over           | Not over |                   |              |      |       |           |              |
| 25 miles       | 25 miles | 67                | 34           | —    | 75    | 59        | 2,160        |
| 50 "           | 50 "     | 20                | 22           | 6    | 1     | 18        | 650          |
| 75 "           | 75 "     | 6                 | 8            | —    | 7     | 6         | 220          |
| 100 "          | 100 "    | 1                 | 3            | —    | —     | 1         | 50           |
| 125 "          | 125 "    | 1                 | 2            | —    | 1     | 2         | 60           |
| 150 "          | 150 "    | 1                 | 8            | 1    | 1     | 2         | 80           |
| 175 "          | 175 "    | 2                 | 5            | 6    | 12    | 4         | 150          |
| 200 "          | 200 "    | —                 | 13           | 26   | 3     | 4         | 140          |
| 225 "          | 225 "    | 2                 | 5            | 61   | —     | 4         | 150          |
| All lengths    |          | 100               | 100          | 100  | 100   | 100       | 3,660        |

Source: General Survey.

### (c) Iron and Steel

Compared with the Commodity Survey, the number of consignments of iron and steel finished and semi-finished products available from the General Survey is very small, some 1,700 compared with 31,600, so that the data from the Commodity Survey, though applicable to only one part of the whole metal manufacture industry, probably presents the more reliable picture of transport demand in the greater part of the industry.\* This data is the basis of the observations that follow.

\* MLR 311 accounts for about a half of total employment in the whole of the metal manufacture industry (p. c. Order V).

**Table 21a: Distribution of consignments in the iron and steel (general) industry (MLH 311) by size and mode of transport**  
Percentages

| Size                |          | Mode of transport |              |       |                     |        | All modes |                     |
|---------------------|----------|-------------------|--------------|-------|---------------------|--------|-----------|---------------------|
|                     |          | Over road vehicle | Road haulier | Rail  | Customer collection | G.P.O. | Percent   | No. of consignments |
| Over                | Not over |                   |              |       |                     |        |           |                     |
|                     | 22 lbs   | —                 | 3            | 3     | —                   | 100    | 2         | 600                 |
| 22 lbs              | 112 "    | 3                 | 3            | 3     | 3                   | —      | 3         | 900                 |
| 112 "               | 560 "    | 6                 | 7            | 3     | 12                  | —      | 5         | 1,730               |
| 560 "               | 1,120 "  | 6                 | 2            | 4     | 3                   | —      | 3         | 1,600               |
| 1,120 "             | 2,240 "  | 9                 | 6            | 5     | 5                   | —      | 6         | 2,040               |
| 1 ton               | 5 tons   | 27                | 25           | 24    | 14                  | —      | 25        | 1,770               |
| 5 tons              | 7½ "     | 6                 | 9            | 21    | 6                   | —      | 13        | 3,990               |
| 7½ "                | 10 "     | 14                | 30           | 30    | 3                   | —      | 30        | 3,180               |
| 10 "                |          | 28                | 37           | 38    | 49                  | —      | 33        | 10,350              |
| All sizes           |          | 100               | 100          | 100   | 100                 | 100    | 100       | —                   |
| No. of consignments |          | 5,030             | 16,780       | 9,160 | 200                 | 310    | —         | 31,600              |

Source: Commodity Survey. Figures are grouped from a sample of 2,850 consignments.  
<sup>1</sup> Includes 130 consignments by "other" transport modes.

**Table 21b: Distribution by length of haul**

| Length of haul |          | Mode of transport |              |      |                     |        | All modes |                     |
|----------------|----------|-------------------|--------------|------|---------------------|--------|-----------|---------------------|
|                |          | Over road vehicle | Road haulier | Rail | Customer collection | G.P.O. | Percent   | No. of consignments |
| Over           | Not over |                   |              |      |                     |        |           |                     |
|                | 25 miles | 7                 | 6            | 13   | 30                  | —      | 9         | 2,830               |
| 25 miles       | 50 "     | 28                | 12           | 13   | 4                   | 32     | 15        | 4,640               |
| 50 "           | 75 "     | 13                | 9            | 4    | 3                   | 16     | 8         | 2,630               |
| 75 "           | 100 "    | 39                | 39           | 27   | 12                  | 18     | 38        | 11,970              |
| 100 "          | 125 "    | 6                 | 8            | 6    | 2                   | 3      | 7         | 2,200               |
| 125 "          | 150 "    | 2                 | 5            | 11   | 24                  | 7      | 6         | 2,000               |
| 150 "          | 200 "    | 3                 | 13           | 9    | 21                  | 18     | 10        | 3,230               |
| 200 "          | 300 "    | 1                 | 6            | 5    | 3                   | 3      | 5         | 1,520               |
| 300 "          |          | 1                 | 2            | 2    | 1                   | 2      | 2         | 930                 |
| All lengths    |          | 100               | 100          | 100  | 100                 | 100    | 100       | 31,600              |

Source: Commodity Survey.

In order to probe farther into the use of each main mode of transport it is necessary to study the allocation by size and length of haul combined, but because of the relative unimportance of the smaller consignments the analysis can be confined to movements over a ton. The figures are given in Table 22 and these show that when road haulage is used for consignments over a ton on hauls over 100 miles, compared with the railways, it is used more for consignments of 1 to 5 tons; it is, *relative terms*, less often used for larger consignments over the longer distances, especially consignments of 10 tons or more moving on hauls over 150 miles. For the latter in particular rail is used almost as often as the haulier (ratio 9:11) and since some of the rail movements in this weight range are possibly very large, in tonnage terms the railways are probably the

main carrier of such large, long distance movements of iron and steel. However, the latter category apart, in *absolute terms* the haulier handles more long distance consignments of iron and steel than the railways.

In the medium distance ranges of 50 to 100 miles the haulier carries more than twice as many consignments as the railways and he is a particularly large carrier of consignments of over 7½ tons while the railways mainly handle 1 to 7½ ton consignments, especially those of 5 to 7½ tons in the 75-100 mile distance range—twice as many of these consignments as the haulier in fact. For short hauls of up to 50 miles, "C" vehicles are used fairly frequently for all consignment sizes but there is a tendency to use the railways for very short hauls of less than 25 miles—possibly on siding connected inter-plant movements.

Table 22: Consignments of over a ton in the iron and steel industry (M.I.H. III) analysis by mode of transport, size and length of haul

|                     |          | Percentage          |             |       |              |             |       |               |             |      |              |             |       |                               |             |       |
|---------------------|----------|---------------------|-------------|-------|--------------|-------------|-------|---------------|-------------|------|--------------|-------------|-------|-------------------------------|-------------|-------|
| Length of haul      |          | Size of consignment |             |       |              |             |       |               |             |      |              |             |       | Total consignments over 1 ton |             |       |
|                     |          | 1 to 5 tons         |             |       | 5 to 7½ tons |             |       | 7½ to 10 tons |             |      | Over 10 tons |             |       |                               |             |       |
| Over                | Not over | 'C' vehicle         | Road hauler | Rail  | 'C' vehicle  | Road hauler | Rail  | 'C' vehicle   | Road hauler | Rail | 'C' vehicle  | Road hauler | Rail  | 'C' vehicle                   | Road hauler | Rail  |
| 25 miles            | 25 miles | 9                   | 5           | 17    | 2            | 4           | 2     | 9             | 11          | 15   | 1            | 9           | 16    | 220                           | 1,040       | 1,000 |
| 50 "                | 50 "     | 22                  | 12          | 11    | 32           | 32          | 16    | 43            | 12          | 29   | 16           | 8           | 4     | 1,080                         | 1,360       | 900   |
| 75 "                | 75 "     | 4                   | 12          | 2     | 36           | 36          | —     | 30            | 5           | 1    | 12           | 5           | 5     | 440                           | 1,130       | 300   |
| 100 "               | 100 "    | 31                  | 48          | 55    | 23           | 40          | 69    | 34            | 50          | 3    | 32           | 42          | 15    | 1,590                         | 5,590       | 2,890 |
| 150 "               | 150 "    | 4                   | 5           | 9     | 13           | 8           | 2     | 11            | 43          | 15   | 16           | 26          | 290   | 1,650                         | 1,430       |       |
| 200 "               | 200 "    | 2                   | 13          | 4     | 2            | 9           | 1     | 2             | 6           | —    | 11           | 20          | 140   | 1,510                         | 630         |       |
| 300 "               | 300 "    | 1                   | 8           | 2     | —            | 6           | 4     | —             | 5           | 9    | 6            | 7           | 14    | 30                            | 920         | 250   |
| All lengths         |          | 100                 | 100         | 100   | 100          | 100         | 100   | 100           | 100         | 100  | 100          | 100         | 100   | 3,240                         | 13,470      | 1,690 |
| No. of consignments |          | 1,360               | 4,140       | 2,340 | 430          | 1,590       | 1,970 | 690           | 1,370       | 910  | 1,370        | 6,170       | 2,570 | —                             | —           | —     |

Source: Commodity Survey.

Comparison of the shares of each main mode, as shown by Table 95, page 84, with the shares estimated from the consignment sample reveals that whereas rail's share is about the same in both estimates, the share of road haulage is rather lower and that of own road vehicles considerably higher in Table 95, page 84. The main reason for the relatively higher annual tonnage figures returned for own transport is the inclusion by some establishments of internal works traffic and also of inward consignment traffic (which was particularly large by own transport in this industry) in their tonnage and expenditure figures, but of course their exclusion from the consignment sample. After adjusting for this difference the share of own road vehicles declines and that of the haulier rises and they are not then significantly different from those shown by the tonnage figures derived from the consignment sample.

As explained earlier, the above observations apply only to the steel manufacturing part of the industry. The remainder of the industry, which consists of manufacture of steel tubes, iron castings and production of light metals such as copper, brass, etc., generates lighter consignments than the heavy branch of the industry and thus use of own road vehicles is mainly for light consignments of up to half ton over hauls of up to 50 miles predominantly, while the railways are also used mainly for light consignments of 2½–5½ tons and medium consignments of 1 to 3 tons. Moreover, there is not the peaking of distribution by length of haul in the 75–100 mile range, which is such a marked feature of the heavy branch of the industry, nor is rail used for short hauls to the extent it is in the latter branch, being used more for longer hauls of over 200 miles. Otherwise, the transport pattern is about the same in both sections of the industry.

#### (f) Non-ferrous metals

Less than a thousand consignments of non-ferrous metals such as aluminium, lead and zinc were picked up in the General Survey and such a relatively (to other commodities) small number precludes detailed analysis of the shipments of these products. Of the consignments made however, a half were handled by own road transport, a quarter by GPO and the remaining quarter by the other modes of transport.

Over 80 per cent of the movements by own vehicle weighed not over 500 lbs but the hauls were mainly over long distances of 100 to 300 miles. All consignments handled by GPO weighed

up to 22 lbs and, as in the case of own transport, hauls were long with two thirds of consignments moving over distances greater than 150 miles. It would seem therefore that industries manufacturing non-ferrous metals are far from markets (but see page 74) and they use GPO wherever they can, it up to the weight limit the Post Office will take; for heavier loads they have recourse to their own road transport.

When other transport modes are used, the haulier is used relatively more for the larger consignments of a ton and over (although large consignments are rarely made by this industry, possibly partly because of the lightness of one of its major products, *ie* aluminium); hauls are mainly over 100 miles. The railways are used for small consignments of up to 500 lbs mainly over the very long distances of more than 300 miles. 'Other' transport, probably air freight, is also used over the very long distances to a small extent.

Table 23: Distribution of consignments of non-ferrous metals by mode of transport

| Mode               | Number of consignments | Per cent |
|--------------------|------------------------|----------|
| Own road vehicle   | 450                    | 41       |
| Road haulier       | 140                    | 15       |
| Rail               | 67                     | 7        |
| G.P.O.             | 230                    | 25       |
| Other <sup>1</sup> | 50                     | 5        |
| All modes          | 930                    | 100      |

Source: General Survey. Figures are given from a sample of 300 consignments.

<sup>1</sup> Includes passenger collection and 'Other' transport.

#### (g) Transport equipment

In 1966, industries producing motor vehicles, parts for motor vehicles, and other transport equipment, mainly used own transport for very small consignments of up to 22 lbs shipped to destinations up to 75 miles away and also for the slightly larger consignments of 2½–5½ tons also on hauls up to 75 miles. The

GPO was used for very small consignments moving predominantly over the longer distances of 100 miles or more and the road haulier for (a) consignments of 22-560 lbs on hauls over 50 miles and (b) consignments heavier than 560 lbs moving over all distances but particularly the longer ones. The railways were relatively little used and then only for light consignments of 22-560 lbs on medium and long hauls.

Since 1966 however, the railways have been developing their company train services for parts of this industry. Also re-location of some motor plants has been occurring and their development will by 1969 probably be affecting the pattern of transport demand within the industry. Thus by the present day, data based on demand in 1966 may underestimate the use of the railways for very large consignments (and therefore underestimate the occurrence of such consignments), and underestimate the proportion of the larger consignments moving over long distances.

Table 24: Distribution of consignments of transport vehicles and equipment by size and mode of transport

|                        |          | Percentage                    |              |      |                    |              |
|------------------------|----------|-------------------------------|--------------|------|--------------------|--------------|
|                        |          | Mode of transport             |              |      |                    | All modes    |
| Size                   |          | Own road vehicle <sup>a</sup> | Road haulier | Rail | Other <sup>b</sup> | No. of cons. |
| Over                   | Not over |                               |              |      | Per cent           |              |
|                        | 22 lbs   | 62                            | 2            | 7    | 88                 | 34           |
| 22 lbs                 | 112 "    | 17                            | 37           | 61   | 4                  | 25           |
| 112 "                  | 560 "    | 15                            | 9            | 29   | 2                  | 12           |
| 560 "                  | 1120 "   | 5                             | 9            | 2    | —                  | 6            |
| 1120 "                 | 2240 "   | 5                             | 31           | 1    | —                  | 6            |
| 1 ton                  | 5 tons   | 12                            | 26           | —    | 6                  | 13           |
| 5 tons                 | 7½ tons  | 4                             | 8            | —    | —                  | 4            |
| 7½ tons                | 10 "     | —                             | 1            | —    | —                  | —            |
| 10 "                   | —        | —                             | 1            | —    | —                  | —            |
| All sizes              |          | 100                           | 100          | 100  | 100                | —            |
| Number of consignments |          | 1,660                         | 790          | 310  | 460                | —            |
|                        |          |                               |              |      |                    | 2,620        |

Source: General Survey. Figures are grossed from a sample of 950 consignments.

<sup>a</sup> A quarter of consignments were retained with weights not stated; these have been distributed in the same proportions as the ones on which weight was stated.

<sup>b</sup> Includes GPO mainly.

Table 25: Distribution of consignments of transport vehicles and equipment by length of haul and mode of transport

|                |          | Percentage        |              |      |          |              |
|----------------|----------|-------------------|--------------|------|----------|--------------|
|                |          | Mode of transport |              |      |          | All modes    |
| Length of haul |          | Own road vehicle  | Road haulier | Rail | Other    | No. of cons. |
| Over           | Not over |                   |              |      | Per cent |              |
|                | 25 miles | 38                | 15           | 5    | 16       | 23           |
| 25 miles       | 50 "     | 23                | 5            | 6    | 8        | 14           |
| 50 "           | 75 "     | 14                | 8            | 20   | 10       | 12           |
| 75 "           | 100 "    | 4                 | 6            | 12   | 6        | 6            |
| 100 "          | 125 "    | 7                 | 28           | 3    | 5        | 13           |
| 125 "          | 150 "    | 2                 | 2            | 8    | 8        | 3            |
| 150 "          | 200 "    | 7                 | 18           | 18   | 18       | 14           |
| 200 "          | 300 "    | 5                 | 10           | 21   | 22       | 11           |
| 300 "          | —        | —                 | 8            | 5    | 7        | 4            |
| All lengths    |          | 100               | 100          | 100  | 100      | 2,620        |

Source: General Survey.

### (b) Engineering and electrical goods

Industries producing goods which fall into the category 'engineering and electrical' can range from those manufacturing heavy machinery such as excavators and earth moving equipment to those producing very light goods such as radios and electronic apparatus. In between these two extremes, the products will include agricultural machinery, industrial machines of all kinds, machine tools, office equipment, electrical machinery such as generators and transformers, wires, cables, and a host of domestic electrical appliances. The demand for transport from such a heterogeneous group is therefore bound to be extremely varied and although this industrial sector was covered in the General Survey, the results must be treated with caution because of the variability in the data and thus rather large sampling errors.

The figures reveal one very interesting feature however. This is the very high proportion of small consignments which are made by this industry. Nearly 90 per cent of consignments are less than 560 lbs compared with about 70 per cent in the transport equipment and chemicals group of commodities, and lower proportions in foodstuffs, building materials and iron and steel products. Large consignments are obviously made by this industry and some can indeed be very large, for example, electrical transformers for power stations, but the frequency of such consignments is so small that, for example, only three consignments larger than 10 tons were picked up in the 3,000 consignments included in the General Survey.

Despite the predominance of small consignments, the main form of transport used by the industry is not own vehicles but the road haulier<sup>a</sup> and the GPO, followed by British Rail. GPO parcels services are used for very small consignments of up to 22 lbs, the haulier is used mainly for consignments of 22-4,120 lbs over short, medium and fairly long distances of up to about 200 miles, while the railways are used for consignments of up to

<sup>a</sup> As in the chemicals group of commodities, this large use of the road haulier results in electrical goods being a significant factor in choice of road haulier versus rail, other factors considered (see Part I, page 22).

500 lbs mainly over the longer hauls of over 200 miles. 'C' licence vehicles, when used, tend to be concentrated on movements of small consignments on hauls of up to 75 miles. They are used also for the relatively infrequent large consignments but predominantly only to destinations up to 75 miles away; the road haulier is preferred for movements of the larger consignments over the longer distances.

As regards the very small consignments of not over 22 lbs, the interesting phenomenon observed in the carriage of, for example, non-ferrous metals and transport equipment, also occurs in the engineering and electrical goods industry. This is the tendency to use own vehicles up to distances of predominantly about 50 miles and to use CVO services above this distance.

The Commodity Survey also covered one branch of the engineering and electrical goods industry, the rather specialised, radio and electronic equipment industry. This activity was of special interest to the authors because it is a fast growing industry; its products are difficult to transport in the sense that they are highly susceptible to damage and also, unlike glass and pottery etc., of very high value, and finally, because of the latter characteristics, on a priori grounds, the products are highly unsuitable to traditional railway carriage except perhaps passenger train parcels services. The allocation of demand for transport by this industry was therefore of particular interest.

The results show that consignments of radio and electronic goods have the same general feature as consignments of all products in the engineering and electrical goods group in that they are predominantly very small in weight but unlike the rest of the industry group there is much heavier reliance on own transport vehicles. There is the same heavy use of Post Office services however. Out of 16,000 consignments included in the Commodity Survey, some 6,300 were consigned by own vehicle and a further 5,300 by CVO so that together these two forms of transport accounted for over 70 per cent of total consignments made. The remainder were fairly equally divided between rail and the road haulier.

**Table 26: Distribution of consignments of engineering and electrical goods by size and mode of transport**

| Percentage             |          |                   |              |      |                    |           |              |
|------------------------|----------|-------------------|--------------|------|--------------------|-----------|--------------|
| Size                   |          | Mode of transport |              |      |                    | All modes |              |
|                        |          | Own road vehicle  | Road haulier | Rail | Other <sup>1</sup> | Per cent  | No. of cons. |
| Over                   | Not over |                   |              |      |                    |           |              |
|                        | 22 lbs   | 30                | 33           | 26   | 98                 | 48        | 1,450        |
| 22 lbs                 | 112 "    | 16                | 34           | 43   | 1                  | 18        | 560          |
| 112 "                  | 560 "    | 34                | 36           | 28   | —                  | 32        | 670          |
| 560 "                  | 1,120 "  | 6                 | 11           | 1    | 1                  | 5         | 340          |
| 1,120 "                | 2,240 "  | 5                 | 3            | —    | —                  | 2         | 60           |
| 2 tons                 | 5 tons   | 7                 | 3            | 2    | —                  | 3         | 80           |
| 5 tons                 | 7½ "     | 1                 | 1            | —    | —                  | 1         | 20           |
| 7½ "                   | 10 "     | 1                 | —            | —    | —                  | —         | 10           |
| 10 "                   | —        | —                 | —            | —    | —                  | —         | —            |
| All sizes              |          | 100               | 100          | 100  | 100                | 100       | —            |
| Number of consignments |          | 480               | 1,870        | 500  | 990                | —         | 3,020        |

Source: General Survey. Figures are rounded from a sample of 696 consignments.

<sup>1</sup> Includes GPO mainly.

**Table 27: Distribution of consignments of engineering and electrical goods by length of haul and mode of transport**

| Percentage     |          |                   |              |      |       |           |              |
|----------------|----------|-------------------|--------------|------|-------|-----------|--------------|
| Length of haul |          | Mode of transport |              |      |       | All modes |              |
|                |          | Own road vehicle  | Road haulier | Rail | Other | Per cent  | No. of cons. |
| Over           | Not over |                   |              |      |       |           |              |
|                | 25 miles | 20                | 5            | 1    | 7     | 8         | 330          |
| 25 miles       | 50 "     | 38                | 25           | 9    | 20    | 25        | 680          |
| 50 "           | 75 "     | 29                | 11           | 7    | 16    | 14        | 440          |
| 75 "           | 100 "    | 2                 | 2            | 4    | 7     | 4         | 130          |
| 100 "          | 125 "    | 1                 | 1            | 5    | 7     | 4         | 110          |
| 125 "          | 150 "    | 2                 | 38           | 11   | 19    | 22        | 650          |
| 150 "          | 200 "    | 3                 | 6            | 4    | 10    | 6         | 190          |
| 200 "          | 300 "    | 3                 | 8            | 31   | 10    | 12        | 370          |
| 300 "          | —        | 2                 | 3            | 27   | 4     | 7         | 220          |
| All lengths    |          | 100               | 100          | 100  | 100   | 100       | 3,020        |

Source: General Survey.

**Table 28a: Distribution of consignments of radio and electronic equipment (MLH 364) by size and mode of transport**

| Percentage             |          |                   |              |       |                     |        |           |                     |  |
|------------------------|----------|-------------------|--------------|-------|---------------------|--------|-----------|---------------------|--|
| Size                   |          | Mode of transport |              |       |                     |        | All modes |                     |  |
|                        |          | Own road vehicle  | Road haulier | Rail  | Customer collection | G.P.O. | Per cent  | No. of cons.        |  |
| Over                   | Not over |                   |              |       |                     |        |           |                     |  |
|                        | 22 lbs   | 35                | 8            | 27    | 21                  | 39     | 51        | 8,070               |  |
| 22 lbs                 | 112 "    | 24                | 15           | 51    | 14                  | 1      | 18        | 2,790               |  |
| 112 "                  | 560 "    | 23                | 22           | 11    | 22                  | —      | 14        | 2,250               |  |
| 560 "                  | 1,120 "  | 7                 | 4            | 1     | 1                   | —      | 4         | 650                 |  |
| 1,120 "                | 2,240 "  | 5                 | 8            | 1     | 1                   | —      | 3         | 430                 |  |
| 2 tons                 | 5 tons   | 7                 | 27           | 2     | 30                  | —      | 7         | 1,100               |  |
| 5 tons                 | 7½ "     | 1                 | 4            | 1     | —                   | —      | 1         | 170                 |  |
| 7½ "                   | 10 "     | —                 | 8            | 1     | 10                  | —      | 1         | 220                 |  |
| 10 "                   | —        | —                 | 4            | 5     | 1                   | —      | 1         | 170                 |  |
| All sizes              |          | 100               | 100          | 100   | 100                 | 100    | 100       | —                   |  |
| Number of consignments |          | 6,360             | 2,660        | 1,750 | 220                 | 3,120  | —         | 15,850 <sup>2</sup> |  |

Source: Commodity Survey. Figures are rounded from a sample of 3,600 consignments.

<sup>2</sup> Includes 140 consignments by coastal shipping and 'other' transport modes.

Table 28a: Distribution by length of haul

|                |          | Percentage        |              |      |                     |        |              |
|----------------|----------|-------------------|--------------|------|---------------------|--------|--------------|
|                |          | Mode of transport |              |      |                     |        | All modes    |
| Length of haul |          | Over road vehicle | Road haulier | Rail | Customer collection | G.P.O. | Per cent     |
| Over           | Not over |                   |              |      |                     |        | No. of cons. |
| 25 miles       | 50 "     | 21                | 24           | 5    | 32                  | 9      | 16           |
| 25 miles       | 50 "     | 21                | 20           | 9    | 48                  | 14     | 17           |
| 50 miles       | 75 "     | 15                | 17           | 2    | 36                  | 15     | 13           |
| 75 "           | 100 "    | 19                | 7            | 10   | —                   | 11     | 14           |
| 100 "          | 125 "    | 3                 | 12           | 22   | —                   | 10     | 9            |
| 125 "          | 150 "    | 10                | 6            | 30   | 1                   | 11     | 10           |
| 150 "          | 200 "    | 9                 | 7            | 4    | 2                   | 13     | 9            |
| 200 "          | 300 "    | 2                 | 5            | 12   | 3                   | 14     | 7            |
| 300 "          |          | 2                 | 3            | 34   | —                   | 6      | 5            |
| All lengths    |          | 100               | 100          | 100  | 100                 | 100    | 15,830       |

Source: Commodity Survey.

Obviously, for the carriage of small consignments of not over 22 lbs there is some competition between own road transport and G.P.O. but, as has been pointed out earlier, the competition is limited since own transport is mostly used on hauls more than 100 miles whereas the Post Office parcels service is used for consignments over all distances. It is interesting to note however that the absolute dominance of own transport for short haul traffic is not a feature of this industry—presumably because consignments of electronic products can be very small and thus create difficulties for building to ensure economical use of own transport. The distribution of small consignments between own transport and the Post Office service is displayed in Table 29 below.

Table 29: Distribution of consignments up to 22 lbs between own account transport vehicles and G.P.O. parcels service

| Length of haul |          | Own transport |     | G.P.O. |     |
|----------------|----------|---------------|-----|--------|-----|
| Over           | Not over | Number        | %   | Number | %   |
| 50 miles       | 100 "    | 530           | 44  | 1,180  | 24  |
| 100 "          | 200 "    | 990           | 48  | 1,390  | 24  |
| 200 "          |          | 170           | 8   | 2,590  | 99  |
| All lengths    |          | 2,690         | 100 | 5,160  | 100 |

Source: Commodity Survey.

The next most frequent size of consignment by this industry is in the weight range 23–112 lbs and here the principal carriers are own vehicles and the railways. There is a marked difference in average journey length by each of these modes with 70 per cent of this size of consignment by own transport moving on hauls up to 100 miles and 80 per cent of the rail borne ones moving over distances greater than 100 miles (34 per cent are in the 200 miles plus bracket). The road haulier carries very few consignments in this weight range.

Table 30: Distribution of consignments of 23 to 112 lbs between own account transport vehicles and the railways

| Length of haul |          | Own transport |     | Rail   |     |
|----------------|----------|---------------|-----|--------|-----|
| Over           | Not over | Number        | %   | Number | %   |
| 50 miles       | 100 "    | 430           | 43  | 120    | 14  |
| 100 "          | 200 "    | 400           | 27  | 30     | 6   |
| 200 "          |          | 320           | 22  | 460    | 46  |
| 300 "          |          | 120           | 8   | 300    | 34  |
| All lengths    |          | 1,470         | 100 | 870    | 100 |

Source: Commodity Survey.

Consignments of between 113 lbs and 560 lbs form 14 per cent of all movements generated by the electronics industry and own transport seems to be used mainly for the carriage of these consignments, with the haulier and rail used occasionally—the haulier more than the railways. There is not a great difference between own account transport and the haulier in the allocation by length of haul except a tendency (which could be the other hand be due to sampling error) to use own transport for the longer hauls of 100 to 200 miles for consignments of this size. There is substantial use of rail for hauls of over 300 miles.

As regards consignments heavier than 560 lbs, for those of up to about a ton own account transport seems to be preferred, while for those over a ton a switch to the haulier occurs, with rail emerging as a carrier equal in importance to the haulier for consignments of ten tons and over. Consignments over a ton are relatively infrequent however and those over ten tons (five tons over) are distinctly rare.

Customer collection occurs in the industry but very infrequently and then only to fairly local destinations.

#### (i) Manufactured metal goods

This group of commodities covers such products as metal structural parts, metal fixtures and fittings, plumbing and heating fixtures, etc. They are all products with two characteristics in common, if they are manufactured almost entirely from metals such as steel, aluminium, copper, brass; they are also mainly destined for the building and building repair industry.

Given these characteristics it is perhaps rather surprising to find the G.P.O. the main carrier, in terms of number of consignments. Put in another way, it is strange that such small consignments (ie up to 22 lbs) as are handled by the Post Office form such a high proportion of the total generated by this industry. It must be that, as in the transport vehicles and equipment industry, meeting demands for spare parts must form a relatively high percentage of activity in the industry. It is interesting to note however that, as with transport equipment, when the demand for a product is of this nature the Post Office parcels service seems to offer the best means of transport. Possibly the demand is highly irregular so that bulking to enable economical use to be made of 'C' vehicles is extremely difficult; also, the consignments are probably required fairly urgently—which would again severely limit the possibilities of holding orders until a sufficient number had accrued to enable own transport to be used. Moreover, the consignments are too small to be handled economically by any other mode of transport.

Larger consignments of 22 to 560 lbs were handled by own vehicles, the haulier and the railways in about equal proportions, but those moved by 'C' vehicles were predominantly



over hauls of up to 75 miles while those consigned by haulier and the railways moved over medium and long distances mainly. Consignments over 560 lbs were relatively infrequent and when made, the lighter ones of between 560 and 1,120 lbs were handled mainly by own transport, the heavier ones of over 1,120 lbs mainly by the road haulier.

**Table 31: Distribution of consignments of metal manufactured goods by size and mode of transport**

|                        |          | Percentages       |              |      |                    |           |              |
|------------------------|----------|-------------------|--------------|------|--------------------|-----------|--------------|
|                        |          | Mode of transport |              |      |                    | All modes |              |
| Size                   |          | Own road vehicle  | Road haulier | Rail | Other <sup>1</sup> | Per cent  | No. of cons. |
| Over                   | Not over |                   |              |      |                    |           |              |
| 22 lbs                 | 22 lbs   | 22                | 7            | 3    | 91                 | 42        | 1,130        |
|                        | 112 "    | 16                | 10           | 28   | 5                  | 12        | 160          |
|                        | 560 "    | 32                | 36           | 53   | 2                  | 34        | 710          |
|                        | 1120 "   | 17                | 6            | 11   | —                  | 7         | 320          |
| 1120 "                 | 2240 "   | 4                 | 16           | 1    | 1                  | 4         | 180          |
|                        | 5 tons   | 4                 | 16           | 3    | —                  | 5         | 150          |
|                        | 7½ "     | 2                 | 5            | —    | —                  | 2         | 50           |
|                        | 10 "     | 1                 | 1            | 1    | —                  | 1         | 30           |
|                        | 20 "     | —                 | 3            | —    | 1                  | 1         | 30           |
| All sizes              |          | 100               | 100          | 100  | 100                | 100       | —            |
| Number of consignments |          | 510               | 700          | 380  | 1,080              | —         | 2,970        |

Source: General Survey. Figures are grossed from a sample of 990 consignments.

<sup>1</sup> Includes G.P.O. mainly.

**Table 32: Distribution of consignments of metal manufactured goods by length of haul and mode of transport**

|                |          | Percentages       |              |      |       |           |              |
|----------------|----------|-------------------|--------------|------|-------|-----------|--------------|
|                |          | Mode of transport |              |      |       | All modes |              |
| Length of haul |          | Own road vehicle  | Road haulier | Rail | Other | Per cent  | No. of cons. |
| Over           | Not over |                   |              |      |       |           |              |
| 25 miles       | 25 miles | 26                | 6            | 3    | 14    | 15        | 440          |
|                | 50 "     | 14                | 3            | 5    | 17    | 11        | 330          |
|                | 75 "     | 9                 | 9            | 2    | 9     | 8         | 240          |
|                | 100 "    | 4                 | 12           | 1    | 4     | 5         | 160          |
|                | 125 "    | 5                 | 4            | 3    | 6     | 5         | 150          |
|                | 150 "    | 5                 | 7            | 15   | 9     | 8         | 240          |
|                | 175 "    | 17                | 12           | 33   | 11    | 16        | 450          |
|                | 200 "    | 16                | 15           | 22   | 24    | 19        | 570          |
|                | 300 "    | 4                 | 32           | 13   | 6     | 13        | 380          |
| All lengths    |          | 100               | 100          | 100  | 100   | 100       | 2,970        |

Source: General Survey.

### (3) Other manufactured goods

The final group of commodities is a miscellaneous category. It covers products such as furniture, paper and paper products, textiles and leather goods of all kinds, clocks and precision goods, manufactures of rubber and wood, etc. Most are con-

sumer goods (very few are consumer durables even) and together they constitute the largest category—in terms of numbers of consignments—within the General Survey.

Because they are moving mainly for final demand, it is not surprising that large consignments of these goods are relatively rare; most movements are in small lots of up to about 560 lbs while a few occur in the weight ranges of up to five tons. As a consequence of the frequency of small consignments, although the main carriers are own account road transport and the road haulier, the Post Office emerges as a significant carrier of these goods. The railways take fourth place in terms of numbers of consignments handled.

More detailed analysis shows that once again there is heavy reliance on the G.P.O. parcels service for the carriage of the smallest consignments on hauls over 50 miles—'C' vehicles carrying such small consignments being used almost entirely for short hauls of below this distance. The carriage of the larger consignments of between 22 lbs and 112 lbs is fairly evenly divided between the three main modes of transport, but movements allocated to 'C' vehicles are very heavily concentrated in the distance range up to 25 miles (90 per cent of all such consignments by own transport). The same is true of consignments weighing between 112 and 560 lbs.

Few consignments weighing more than 560 lbs were carried by the railways and although the haulier and own transport handled about the same number, use of the latter mode of transport is mainly confined to movements of up to 50 miles while the road haulier is used mainly for hauls above this distance.

**Table 33: Distribution of consignments of 'other' manufactured goods by size and mode of transport**

|                        |          | Percentages       |              |       |                    |           |              |
|------------------------|----------|-------------------|--------------|-------|--------------------|-----------|--------------|
|                        |          | Mode of transport |              |       |                    | All modes |              |
| Size                   |          | Own road vehicle  | Road haulier | Rail  | Other <sup>1</sup> | Per cent  | No. of cons. |
| Over                   | Not over |                   |              |       |                    |           |              |
| 22 lbs                 | 22 lbs   | 24                | 13           | 17    | 55                 | 36        | 3,460        |
|                        | 112 "    | 36                | 48           | 54    | 2                  | 35        | 3,040        |
|                        | 560 "    | 24                | 22           | 25    | 1                  | 18        | 4,500        |
|                        | 1120 "   | 3                 | 5            | 2     | —                  | 3         | 700          |
|                        | 2240 "   | 4                 | 2            | 1     | 1                  | 2         | 500          |
|                        | 5 tons   | 7                 | 9            | 1     | 1                  | 5         | 1,310        |
|                        | 7½ "     | 1                 | 2            | —     | —                  | 1         | 170          |
|                        | 10 "     | 1                 | 1            | —     | —                  | —         | 120          |
|                        | 20 "     | —                 | 1            | —     | —                  | —         | 90           |
| All sizes              |          | 100               | 100          | 100   | 100                | 100       | —            |
| Number of consignments |          | 8,370             | 7,000        | 4,860 | 5,900              | —         | 26,130       |

Source: General Survey. Figures are grossed from a sample of 6,490 consignments.

<sup>1</sup> Includes G.P.O., container collection, coastal shipping and 'other' transport, but 96 per cent were by G.P.O.

**Table 34: Distribution of consignments of 'other' manufactured goods by length of haul and mode of transport**

|                |          | Percentages        |              |      |       |           |              |
|----------------|----------|--------------------|--------------|------|-------|-----------|--------------|
|                |          | Mode of transport  |              |      |       | All modes |              |
| Length of haul |          | Other road vehicle | Road haulier | Rail | Other | Per cent  | No. of cons. |
| Over           | Not over |                    |              |      |       |           |              |
|                | 25 miles | 73                 | 15           | 1    | 11    | 12        | 8,420        |
| 25 miles       | 50 "     | 8                  | 30           | 16   | 12    | 11        | 2,830        |
| 50 "           | 75 "     | 2                  | 9            | 10   | 10    | 8         | 2,130        |
| 75 "           | 100 "    | 3                  | 15           | 5    | 8     | 8         | 2,900        |
| 100 "          | 125 "    | 1                  | 17           | 13   | 15    | 10        | 2,730        |
| 125 "          | 150 "    | 1                  | 5            | 9    | 4     | 5         | 1,320        |
| 150 "          | 200 "    | 3                  | 9            | 23   | 15    | 11        | 2,860        |
| 200 "          | 300 "    | 5                  | 10           | 14   | 10    | 9         | 2,330        |
| 300 "          |          | 1                  | 9            | 9    | 8     | 5         | 1,530        |
| All lengths    |          | 100                | 100          | 100  | 100   | 100       | 35,330       |

Source: General survey.

Paper and paper products form part of the 'other' manufactured goods group and the paper industry was also one of the industries studied in the Commodity Survey. The industry is rather dissimilar to many of the other activities included in the 'other' manufacturing group since a sizeable part of its activity consists in producing intermediate rather than final products, for example, newsprint for the newspaper industry. It can therefore be termed the 'heavy' branch of the other manufacturing group and its consignments will tend to be larger than is normal for the rest of the group. This is indeed seen to be the case from the comparison of the distribution of consignments in Tables 33 and 35(a); in the latter table 27 per cent of all consignments are over 500 lbs in weight while in the former the proportion is only 11 per cent.

**Table 35a: Distribution of consignments of paper and paper products (MILH 461-3) by size and mode of transport**

|                        |          | Percentages       |              |       |                   |        |           |              |
|------------------------|----------|-------------------|--------------|-------|-------------------|--------|-----------|--------------|
|                        |          | Mode of transport |              |       |                   |        | All modes |              |
| Size                   |          | Own road vehicle  | Road haulier | Rail  | Custom collection | G.P.O. | Per cent  | No. of cons. |
| Over                   | Not over |                   |              |       |                   |        |           |              |
| 22 lbs                 | 22 lbs   | 24                | 22           | 1     | 4                 | 97     | 28        | 9,180        |
| 112 "                  | 112 "    | 25                | 30           | 24    | 6                 | 3      | 25        | 8,130        |
| 590 "                  | 590 "    | 18                | 20           | 55    | 4                 | —      | 20        | 6,770        |
| 1120 "                 | 1120 "   | 12                | 3            | 18    | 10                | —      | 6         | 2,110        |
| 1120 "                 | 2340 "   | 8                 | 3            | 5     | 17                | —      | 4         | 1,400        |
| 1 ton                  | 5 tons   | 9                 | 11           | 3     | 40                | —      | 10        | 3,300        |
| 5 tons                 | 7 1/2 "  | 2                 | 3            | 2     | 7                 | —      | 2         | 700          |
| 7 1/2 "                | 10 "     | 3                 | 1            | —     | 9                 | —      | 2         | 550          |
| 10 "                   |          | 1                 | 3            | —     | 3                 | —      | 3         | 1,300        |
| All sizes              |          | 100               | 100          | 100   | 100               | 100    | 100       | —            |
| Number of consignments |          | 8,940             | 15,000       | 2,010 | 230               | 3,030  | —         | 31,240       |

Source: Commodity Survey. Figures are grouped from a sample of 4,240 consignments.

In total, some 33,000 of the paper industry's consignments were covered and nearly 60 per cent of these were despatched by road haulage. A further 27 per cent were carried by own transport, 9 per cent by G.P.O. and 6 per cent by rail. In view of the fairly large numbers of small consignments of 22 lbs or less, it is approximately 9,000 or just over a quarter of the total. It is surprising that the share of the G.P.O. is not larger; in the other branches of the 'other manufacturing' industry group and in most other industries producing relatively large numbers of small consignments, for example, transport equipment industry, chemicals, engineering and electrical goods, the share of the Post Office is much more significant. Instead, in this industry, somewhat uniquely, the haulier is used more often than the G.P.O. for the long distance carriage of these small consignments.\* For very short distance movements, as in other industries, own account transport is preferred however (see Table 36).

**Table 35b: Distribution by length of haul**

|                |          | Percentages       |              |      |                   |           |              |
|----------------|----------|-------------------|--------------|------|-------------------|-----------|--------------|
|                |          | Mode of transport |              |      |                   | All modes |              |
| Length of haul |          | Own road vehicle  | Road haulier | Rail | Custom collection | G.P.O.    | No. of cons. |
| Over           | Not over |                   |              |      |                   |           |              |
|                | 25 miles | 47                | 3            | 1    | 37                | 2         | 15           |
| 25 miles       | 50 "     | 35                | 26           | 5    | 27                | 3         | 25           |
| 50 "           | 75 "     | 7                 | 6            | 5    | 4                 | 27        | 3            |
| 75 "           | 100 "    | 3                 | 5            | 6    | 5                 | 13        | 5            |
| 100 "          | 125 "    | 2                 | 3            | 13   | 18                | 9         | 4            |
| 125 "          | 150 "    | —                 | 10           | 5    | 4                 | 8         | 7            |
| 150 "          | 200 "    | 3                 | 15           | 40   | 9                 | 7         | 15           |
| 200 "          | 300 "    | 1                 | 17           | 11   | 4                 | 34        | 12           |
| 300 "          |          | 2                 | 12           | 11   | —                 | 7         | 9            |
| All lengths    |          | 100               | 100          | 100  | 100               | 100       | 33,240       |

Source: Commodity Survey.

**Table 36: Allocation of small consignments of up to 22 lbs by mode of transport**

|                        |          | Percentages   |              |        |
|------------------------|----------|---------------|--------------|--------|
| Length of haul         |          | Own transport | Road haulier | G.P.O. |
| Over                   | Not over |               |              |        |
| 25 miles               | 25 miles | —             | —            | 2      |
| 100 "                  | 100 "    | 34            | 47           | 45     |
| 300 "                  |          | —             | 33           | 35     |
| All lengths            |          | 100           | 100          | 100    |
| Number of consignments |          | 1,800         | 4,000        | 2,900  |

Source: Commodity Survey.

\* This results in increasing consignment size emerging as a marginally significant factor in the choice between 'C' vehicle and road haulier in this industry, see Part I, page 21.

Slightly larger consignments of between 22 and 112 lbs also constitute about a quarter of the total generated by the paper industry and as in a number of other industries where such consignments are relatively numerous, the consignments are divided between each of the main means of transport—own vehicle, the haulier and rail. In the paper industry however rather more use is made of the haulier than of own transport, while the railways are used much less frequently than the other two modes.

Own vehicles, when used, are very largely employed for short haul traffic and this also applies to larger consignments of be-

tween 112 and 560 lbs and consignments of 560–1,120 lbs. For larger consignments, the length of haul on which own transport is used increases to about 75 miles but even for very large consignments of 10 tons or more own vehicles are rarely used on journeys over this distance. Indeed, the road haulier is preferred for medium and long hauls of consignments of all sizes over 22 lbs. The railways are used mainly for consignments in the 112–560 lbs range but even then not so frequently as the haulier and they are rarely used for consignments over about a ton although very large consignments of 10 tons or more are not uncommon in this industry.

Table 37: Consignments of over 22 lbs in the paper and paper products industry (MLH 481-3) analysis by mode of transport, size and length of haul

Percentage

| Length of haul      |          | Size of consignment |              |       |              |              |      |             |              |      |             |              |      |
|---------------------|----------|---------------------|--------------|-------|--------------|--------------|------|-------------|--------------|------|-------------|--------------|------|
|                     |          | 25–560 lbs          |              |       | 560–2240 lbs |              |      | 1–5 tons    |              |      | Over 5 tons |              |      |
|                     |          | 'C' vehicle         | Road haulier | Rail  | 'C' vehicle  | Road haulier | Rail | 'C' vehicle | Road haulier | Rail | 'C' vehicle | Road haulier | Rail |
| Over                | Not over |                     |              |       |              |              |      |             |              |      |             |              |      |
| 25 miles            | 25 miles | 39                  | 1            | 1     | 41           | 7            | —    | 36          | 7            | 5    | 33          | 6            | —    |
| 50 "                | 50 "     | 53                  | 25           | 2     | 38           | 17           | 16   | 26          | 18           | 16   | 12          | 17           | —    |
| 75 "                | 75 "     | 2                   | 6            | 4     | 6            | 5            | 12   | 13          | 7            | 4    | 40          | 9            | —    |
| 100 "               | 100 "    | 3                   | 6            | 5     | 5            | 5            | 13   | 7           | 9            | 23   | 3           | 3            | —    |
| 150 "               | 200 "    | 2                   | 35           | 66    | 7            | 30           | 46   | 13          | 24           | 27   | 9           | 27           | 30   |
| 200 "               |          | 1                   | 27           | 32    | 3            | 46           | 16   | 5           | 33           | 39   | 3           | 36           | 50   |
| All lengths         |          | 100                 | 100          | 100   | 100          | 100          | 100  | 100         | 100          | 100  | 100         | 100          | 100  |
| No. of consignments |          | 3,140               | 9,350        | 1,510 | 1,580        | 1,540        | 500  | 770         | 2,050        | 50   | 480         | 1,200        | 40   |

## Special features relating to consignments

It has often been asserted that the service rendered by a form of transport constitutes not only the movement of goods between two points but also additional features such as delivery within a specified time or in a certain manner and even ancillary operations such as warehousing, collection of money or further orders from the consignee, and so on. Indeed, the case for some modes of transport has been made more from the point of view of these additional factors than the direct service of transporting. Thus, during the present survey, in order to throw more light on the nature of and importance attached to these factors, in addition to gathering information on the physical characteristics of the various consignments made, establishments were asked to indicate whether the consignment could be said to have one or more of six special features listed. The features were (a) the need for the vehicle or wagon to have a specialised body, for example, refrigerated, insulated, or otherwise specially equipped; (b) the transit occurred between two establishments which were situated in fairly close proximity to one another so that a 'production line' type of movement was occurring; (c) the movement was a purely local delivery; (d) the commodity involved was perishable; (e) the consignment was urgently required; (f) the name of the consignee was prominently displayed on the vehicle carrying the consignment; (g) an activity other than transport was coupled to the consignment's delivery, for example, servicing, installation, collection of orders etc; (h) the load was an indivisible one which could not go by rail.

Some of these features were included in the list of variables used in the probability analysis in Part I and an account of their influence on modal choice is given in the Summary on page 66 ahead. First, however, an account is given of the findings which emerge from the data collected on special features.

The results indicate that a number of consignments had at least one special feature or other; some 60 per cent of the consignments included in the General Survey contained an entry against this section. On the other hand few consignments had more than one or two special features attached to them—the average number of features per consignment with a special feature was 1.8.

The most common feature indicated was the fact that the producer's name and the name of the product was displayed while the consignment was in transit; a third of all consignments were attributed with this characteristic. The only other features of importance were the urgent nature of the consignment (defined to mean more urgently required than usual) and that the consignment was moving for local delivery.

### Analysis by mode of transport

As may be expected, the relative importance of various features varied according to the means of transport used. Advertising while the consignment was in transit occurred very frequently only in 'C' licence transport, being a feature of over 80 per cent of all consignments handled by own transport compared with

14 per cent of those moved by the road haulier and 2 per cent by rail. Similarly, local delivery (defined as radius up to 25 miles) is an important feature only in 'C' transport, occurring on 52 per cent of all consignments by own transport (and customer collection, which was mainly in 'C' licensed vehicles). This proportion corresponds closely with the proportion of consignments by 'C' vehicles moving on hauls up to 25 miles (61 per cent, see Table 2, page 24). Urgent consignments however, although mainly a feature of 'C' transport, were also a fairly common feature of transport by public operators, road, rail and GPO, where they accounted for about 1 in 7 of all consignments handled.

Other fairly common features of consignments moving by transport on own account include perishable nature of the commodity and that the consignment was being transported between two establishments of the same firm, each occurring on about 1 in 7 of all consignments. On the other hand, contrary to previous belief, neither the need for a special vehicle body nor the need for an extra service were often attached to consignments moving by 'C' vehicles.

In the case of carriage by public operators, as indicated above, the only special feature which was fairly frequently attached to a consignment was that it was required urgently, but local delivery and advertising were mentioned with equal frequency when the movement was by road haulage.

The proportion of consignments attributed with a special feature was much higher in own account transport than in public transport. Indeed, over 90 per cent of all consignments carried by 'C' vehicles had at least one feature listed compared with about 40 per cent of those carried by the road haulier, about 30 per cent of those handled by the GPO and about 20 per cent of the rail-borne ones. Moreover, the number of features listed on each consignment attributed with having a special feature was higher in 'C' transport; two or three features being indicated compared with one or two when the consignment was being carried by the road haulier and normally one when the movement was by GPO or rail.

The relative infrequency with which the need for a specialised vehicle was indicated when the consignment was despatched by own road transport vehicle is, on first appraisal, a rather unexpected result. Previously the indications had been that one of the major reasons for the use and growth of 'C' licensed transport was the need for specialised vehicles which could not be provided at competitive rates by public transport. For example, the VATA survey<sup>†</sup> stated 'a large number of vehicles of special design or with special fittings are operated under 'C' licences. These vehicles can sometimes be provided by public transport but to compete with the trader's own vehicle they must be inter-

<sup>†</sup> 'Survey of 'C' licensed vehicles.' Traders Road Transport Association Ltd, October 1959.

graded with his materials handling technique at all points. This often means that the vehicle must be placed at the exclusive service of the trader. In other words, if trade and industry are to use specialised vehicles provided by public services, they will require them to be operated under conditions which approximate to those under which 'C' licensed transport works. Also,

Table 38: Number of consignments with special features as a percentage of all consignments carried by each mode\*

| Feature   | Own vehicle | Contract-hire | Road haulier | Rail | G.P.O. | All Modes |
|---|-------------|---------------|--------------|------|--------|-----------|
| Special body  | 6           | 1             | 3            | 2    | —      | 3         |
| Inter-establishment move  | 15          | 4             | 8            | 2    | 2      | 8         |
| Local delivery  | 52          | 52            | 13           | 1    | 9      | 35        |
| Perishable  | 14          | 2             | 1            | —    | —      | 5         |
| Urgent  | 53          | 22            | 13           | 13   | 15     | 20        |
| Advertisement   | 82          | 42            | 14           | 3    | 4      | 34        |
| Rail service  | 9           | 1             | 6            | 3    | 1      | 5         |
| Indivisible load  | 3           | 1             | 3            | —    | —      | 3         |
| Average number of features per consignment with a special feature | 2.3         | 1.5           | 1.4          | 1.0  | 1.1    | 1.6       |

Source: General Survey.

\*The figures in this table do not add to 100 per cent because more than one feature was often listed per consignment.

Ministry of Transport surveys of characteristics of the road goods vehicle fleet have shown that the number of specialised vehicles is much greater, in absolute and proportional terms, in 'C' licence operation than in public road haulage. How can the findings of the present survey square up to these facts?

The primary reason relates to the difference in coverage between the TRTA and MOT vehicle surveys, and the present enquiry. The first two surveys related to vehicles operated by all industries—extractive, manufacturing and distributive, while the present survey relates only to manufacturing industry. Consequently, if the results of the former are examined with this proviso in mind, the findings of the various surveys are much less contradictory. For example, although the TRTA survey noted the need for a specialised vehicle fairly highly as a reason for use of 'C' vehicles, the detailed results of that survey showed that this reason arose predominantly in the extractive, construction and distributive parts of the enquiry. In manufacturing, the reason was not very important. Similarly, the MOT statistics of type of vehicle in use in each industry reveals that, proportionately, the numbers of specialised own account vehicles in use in manufacturing industry alone were about the same as in road haulage.

Thus, the relatively infrequent use of own transport for consignments requiring special facilities in manufacturing industry, which is a particularly interesting result of the present survey, is not in contradiction with any information that existed previously.

#### Analysis by type of commodity/industry

The difference between commodities in type of feature listed is interesting. As might be expected, perishable consignments occur more frequently in the food industry than in any other branch of manufacturing; indeed, perishability is not a common feature of any other commodity except, to a minor extent,

chemicals. The need for a specialised body on the vehicle is also only common when foodstuffs are carried and although advertising on the vehicle is a feature of between, roughly, a quarter and a third of all consignments made in most industries, it occurs on two-thirds of consignments of foodstuffs—probably because a high proportion of the consignments are in a form ready for final consumption and are moving to retail outlets.

Although urgent consignments seem to be a feature of between a seventh and a fifth of all consignments made in most industries, the exceptions are the foodstuffs industry where urgent consignments amount to nearly 30 per cent of all consignments and the transport vehicles and equipment industry which is well below average with 6 per cent of its consignments deemed urgent. As regards the latter industry, however, it should be noted that it has an above average number of inter-establishment movements so that the definition of urgent becomes relevant here to a much greater degree than usual. Thus, an industry may have few consignments deemed urgent but urgency can still be a general feature of a high proportion of its consignments—as would presumably be the case where inter-plant movements are of a production line type (unless heavy stock holding is commonplace).

Local delivery is important in all industries except transport vehicles and equipment and the proportion of consignments involved rises from one in six in the electrical goods industry to one in three in the building materials industry and almost one in two consignments in the foodstuffs industry.

Only in the building materials group of commodities are indivisible loads fairly common, while the need for an ancillary service arose most often when metal manufactured goods were being carried. The need for an extra service also occurred on a boat one in six consignments of building materials and one in ten consignments of iron and steel finished and semi-finished products.

The results of the question in the Commodity Survey concerning special features attached to consignments add relatively little to the information obtained from the General Survey except perhaps to display again the differences that occur between industries in the proportion of consignments which are regarded as possessing special features and the type of feature involved. The foodstuffs industry studied, for example, is heavily involved in local delivery and, most frequently of all, that advertising occurred on the transporting vehicle. Own transport predominated in the carriage of consignments with either of these characteristics. In the case of the three other features fairly commonly listed by this industry—special body needed, inter-establishment move, consignment urgently required—although 'C' vehicles were used for almost all of the first category of consignment, the road haulier was used for about a third of the latter two types and the railways for just under a fifth of the inter-establishment movements (see Table 41).

The 'heavy' end of the chemicals industry (M.C.N. 271), unlike the very diverse range of activities classified to the whole of the chemicals and allied industry covered by the General Survey, regarded about a fifth of its movements as requiring a specialised vehicle while nearly a tenth were inter-establishment movements. The road haulier was used for the vast bulk of the inter-establishment moves and mainly when a specialised vehicle was required. The proportion of consignments of this industry with other special features was about the same as in the chemicals group in the General Survey (except that advertising was relatively more common) and the three main features

were local delivery, urgency and advertising (see Table 40). 'C' vehicles were used mainly for local delivery and urgent consignments but the haulier's share was not markedly below that of the 'C' vehicles. The much higher share of own account transport was apparent where advertising was regarded as a special feature of the consignment however.

Small manufacturers had fewer local deliveries and fewer consignments requiring an ancillary service than the rest of the iron and steel industry, but in other respects the incidence of special features attaching to consignments was about the same and the main ones were inter-establishment movements, local delivery, urgency and advertising. The road haulier and the railways were used mainly for the inter-establishment movements—the haulier more frequently than the railways. The haulier was also used mainly for local deliveries and urgently required consignments but 'C' vehicles were predominant when advertising was deemed a feature of the movement.

The electronic equipment industry covered in the Commodity Survey was not significantly different from the whole of the electrical goods industry covered by the General Survey except that advertising seemed to occur much more frequently. The most frequently indicated special features were therefore inter-establishment movements, local delivery, urgency and advertising. A high proportion of inter-establishment moves were handled by own transport in this industry as were the consignments moving for local delivery or those where advertising was a feature of the movement. Urgent consignments were also sent mainly by own vehicle but an unexpectedly high proportion were sent by own parcels service. The own also handled the bulk of those inter-establishment movement and local deliveries which were not handled by own transport. The need for an ancillary service was mentioned on about one in every twelve consignments—the highest proportion for the five selected industries studied in the Commodity Survey—and although 'C' vehicles were used for about half such consignments the own parcels service was used for a third of them.

The final industry studied in the Commodity Survey, is the paper and paper products industry, is also not dissimilar with respect to special features attached to consignments to the broader grouping 'other manufactured goods' used in the

General Survey. Three features occurred fairly often—advertising, local delivery and urgency. Most of the first two types of consignment were handled by own transport but the road haulier shared with own vehicles in the carriage of urgent consignments while the Post Office was used for about one in ten of such consignments.

#### Summary

Although, as Table 38 shows, the average number of features per consignment and also the incidence of consignments with a special feature is far greater in 'C' licensed than in public transport, this is partly a function of type of commodity carried since, as Table 39 shows, about eight in every ten consignments of foodstuffs and building materials were attributed with having a special feature compared with five or six for most other commodities, and as shown in Chapter 2, over 90 per cent of consignments of foodstuffs and 70 per cent of building materials are handled by 'C' vehicles. On the other hand the type of commodity carried does not account for the whole of the difference in this respect between own account and public transport; in the carriage of some other commodities, for example, iron and steel, where 'C' transport is used less frequently than public transport, special features tend to be listed more frequently when the movement is by 'C' vehicles. There is therefore a tendency throughout manufacturing industry for a consignment with a special feature to be handled by own transport rather than by public operators. But the definition of a special feature must be remembered in this context; it includes advertising and local delivery and it is doubtful whether the choice of these as 'special features' was a sufficiently meaningful one. Thus, if the list of features is re-drawn to exclude these two, since most of the special features attributed to a movement by own vehicles are local delivery and advertising, the difference between own transport and public operators becomes less marked with 55 per cent of consignments carried by own vehicles having a special feature compared with 27 per cent of those carried by a public operator.

In any event, none of the special features included in the probability analysis in Part I, is, consignment required more

Table 39. Number of consignments with special feature as percentage of all consignments: analysis by commodity

| Commodity           | Special feature |                          |                |            |        |             |               |                  | Total No. of consignments | *   | †  |
|---------------------|-----------------|--------------------------|----------------|------------|--------|-------------|---------------|------------------|---------------------------|-----|----|
|                     | Special body    | Inter-establishment move | Local delivery | Perishable | Urgent | Advertising | Extra service | Indivisible load |                           |     |    |
| Foodstuffs          | 15              | 29                       | 43             | 52         | 29     | 67          | 6             | 2                | 16,510                    | 3.9 | 81 |
| Crude materials     | 1               | 12                       | 27             | 1          | 7      | 36          | 1             | 2                | 2,099                     | 1.8 | 48 |
| Chemicals           | 2               | 2                        | 25             | 2          | 18     | 21          | —             | 2                | 4,060                     | 1.4 | 53 |
| Building materials  | 1               | 9                        | 33             | 1          | 38     | 49          | 16            | 16               | 3,660                     | 2.6 | 10 |
| Iron and steel      | 1               | 10                       | 28             | —          | 20     | 33          | 10            | —                | 1,710                     | 1.9 | 33 |
| Non-ferrous metals  | 3               | 3                        | 18             | —          | 14     | 30          | —             | 2                | 930                       | 1.2 | 96 |
| Electrical goods    | 1               | 4                        | 16             | —          | 17     | 33          | 6             | 1                | 3,000                     | 1.5 | 43 |
| Transport equipment | 2               | 12                       | 8              | 1          | 6      | 38          | 5             | 1                | 2,620                     | 1.1 | 99 |
| Metal accessories   | 1               | 8                        | 19             | —          | 17     | 34          | 22            | 6                | 2,970                     | 1.8 | 39 |
| Other manufactures  | 2               | 4                        | 24             | —          | 25     | 26          | 3             | 2                | 26,330                    | 1.6 | 52 |
| All commodities     | 3               | 8                        | 35             | 5          | 20     | 34          | 5             | 3                | 64,354                    | 1.8 | 59 |

Source: General Survey.

\* Average number of features per consignment with a feature listed.

† Consignments with at least one special feature as a percentage of all consignments.

Includes 560 consignments of 'other' and unclassified commodities.

urgently than usual, auxiliary service performed, inter-establishment movements, special body required, emerged as important factors in the choice between modes of transport. Moreover, had two other factors been included—perishable consignment and indivisible load—it is highly probable that neither of these would have proved significant since they occur relatively infrequently (see Table 38). 'Local delivery' would have proved a significant influence on choice between own transport and professional operators but local delivery is a function of length of haul and it is incorporated in the latter variable in the probability analysis. As measured in the present survey, 'Advertisement' may also have proved a significant factor in the choice between own and professional transport but it would have been extremely difficult to put an evaluation on its correct importance: the fact that the producer's name is displayed on the vehicle while the consignment is in transit need not necessarily influence the distribution of transport between modes.

#### The allocation of consignments with special features to different transport modes and reasons stated for choice of main mode of transport

A question was asked during the survey concerning the reasons why establishments chose a particular mode of transport as their main one. Six reasons were listed and the respondent was asked to state his first and second choice. The six reasons were: ready availability when required, speed of delivery (to meet customer's requirements), speed of delivery (to get quick turn round of vehicles), speed of delivery (to keep stock levels low), good record with respect to damage, good record with respect to losses.

The results to this question indicate that in all branches of manufacturing industry the most important reasons for choice

of main mode was either speed of delivery to meet customer's requirements or ready availability when required. Moreover, when either of these two was stated as first reason for choice the other was given as the second reason; in no industry was any of the other four factors listed regarded as being a major influence on choice. These results of the General Survey are supported by the findings of the Commodity Survey, in which each of the selected industries ranked ready availability or speed of delivery as first or second reason for choice of main mode.

Although it is dangerous to infer too much from a comparison of the general reasons for choice of main mode with the special features attaching to particular consignments in different industries, it is interesting to note that if advertising and local delivery are disregarded as special features, in the industries included in the Commodity Survey when speed of delivery to meet customer's requirements was ranked first reason for choice, urgent consignments formed the highest proportion of consignments regarded as having special features. Also, the ranking of ready availability as second reason for choice corresponds with inter-establishment movements forming the second highest proportion of consignments with a special feature. When ready availability was ranked as first reason for choice, in one instance—the foodstuffs industry—this corresponded with perishable consignments forming the highest proportion of consignments regarded as having special features, in the other instance—the heavy chemicals industry—

Table 41: Share of each mode of transport in carriage of consignments with special features

| Industry             | Mode of transport | Percentage |    |    |    |    |    |    |     |
|----------------------|-------------------|------------|----|----|----|----|----|----|-----|
|                      |                   | 1          | 2  | 3  | 4  | 5  | 6  | 7  | 8   |
| Food                 | Own vehicle       | 30         | 49 | 84 | 88 | 88 | 93 | 90 | 100 |
|                      | Road hauler       | 7          | 32 | 15 | 9  | 28 | 6  | 30 | —   |
|                      | Rail              | 1          | 17 | —  | 2  | 3  | —  | —  | —   |
|                      | Other             | 2          | 2  | 1  | 1  | 1  | —  | —  | —   |
| Chemicals            | Own vehicle       | 37         | 34 | 49 | 66 | 51 | 67 | 76 | 34  |
|                      | Road hauler       | 47         | 40 | 38 | 7  | 40 | 27 | 18 | 55  |
|                      | Rail              | 7          | 3  | 1  | 6  | 4  | 3  | —  | —   |
|                      | Other             | 9          | 3  | 12 | 21 | 5  | 4  | 4  | 11  |
| Iron and steel       | Own vehicle       | 49         | 6  | 32 | 94 | 29 | 68 | —  | 3   |
|                      | Road hauler       | 43         | 37 | 48 | 2  | 46 | 30 | 22 | 33  |
|                      | Rail              | 8          | 52 | 12 | —  | 18 | —  | 6  | —   |
|                      | Other             | —          | 5  | 5  | 4  | 7  | 2  | 72 | 44  |
| Electronic equipment | Own vehicle       | 43         | 70 | 75 | 65 | 90 | 89 | 51 | 72  |
|                      | Road hauler       | 37         | 9  | 5  | —  | 11 | 2  | 7  | 1   |
|                      | Rail              | —          | 1  | —  | —  | 4  | 7  | 14 | —   |
|                      | Other             | —          | 20 | 26 | 35 | 32 | 8  | 32 | 27  |
| Paper                | Own vehicle       | 95         | 44 | 75 | 1  | 42 | 80 | 78 | 30  |
|                      | Road hauler       | 2          | 50 | 22 | 87 | 40 | 15 | 28 | 80  |
|                      | Rail              | 3          | 3  | 1  | —  | 7  | 1  | —  | —   |
|                      | Other             | —          | 3  | 4  | 5  | 11 | 4  | —  | —   |

Source: Commodity Survey.

- Notes: 1 = Special body  
2 = Inter-establishment move  
3 = Local delivery  
4 = Perishable  
5 = Urgent  
6 = Advertisement  
7 = Extra service  
8 = Indivisible load

Table 40: Number of consignments with a special feature expressed as a percentage of all consignments: analysis for selected industries

| Feature  | Percentage |           |              |                      |        |
|--|------------|-----------|--------------|----------------------|--------|
|  | Industry   |           |              |                      |        |
|  | Foodstuffs | Chemicals | Iron & steel | Electronic equipment | Paper  |
| 1 Special body   | 11         | 18        | 2            | 1                    | 3      |
| 2 Inter-establishment move   | 10         | 8         | 9            | 9                    | 3      |
| 3 Local delivery   | 35         | 23        | 16           | 25                   | 29     |
| 4 Perishable   | 35         | 4         | 3            | 1                    | 2      |
| 5 Urgent   | 20         | 21        | 19           | 11                   | 35     |
| 6 Advertisement  | 66         | 38        | 32           | 43                   | 37     |
| 7 Extra service  | —          | 3         | 1            | 8                    | —      |
| 8 Indivisible load   | —          | 3         | 1            | 4                    | 1      |
| Total number of consignments   | 22,580     | 30,300    | 31,600       | 15,150               | 33,240 |
| Average number of features per consignment within features listed        | 2.3        | 1.7       | 1.5          | 1.6                  | 1.6    |
| Consignments with at least one feature as percentage of all consignments | 85         | 69        | 56           | 68                   | 62     |

Source: Commodity Survey.

Table 42: Comparison of reasons stated for first choice of main mode of transport and special features attached to individual consignments\*

| Industry                       | General feature                               | Special feature                          |
|--------------------------------|---|--|
| Food<br>(M.L.H. 314, 315)      | 1. Ready availability<br>2. Speed of delivery | 1. Perishable<br>2. Urgent               |
| Chemicals<br>(M.L.H. 271)      | 1. Ready availability<br>2. Speed of delivery | 1. Urgent<br>2. Special body             |
| Iron and Steel<br>(M.L.H. 311) | 1. Speed of delivery<br>2. Ready availability | 1. Urgent<br>2. Inter-establishment move |
| Electronics<br>(M.L.H. 264)    | 1. Speed of delivery<br>2. Ready availability | 1. Urgent<br>2. Inter-establishment move |
| Paper<br>(M.L.H. 485-8)        | 1. Speed of delivery<br>2. Ready availability | 1. Urgent<br>2. Inter-establishment move |

Source: Commodity Survey.

\* Excluding advertising and local delivery.

it corresponded with urgency and need for specialised vehicle as main features attaching to consignments.

However it has been stressed above that the picture presented in Table 42 above is not conclusive. One reason for this is that the special features listed for the consignment sample were perhaps not a sufficient reflection of the general features listed in the main part of the questionnaire, or, vice versa. On the other hand, without compiling a lengthy list of features, which would have deterred even the most ardent respondent, in the 'ex ante' period it was difficult to envisage which features were likely to emerge as the most influential ones.



## Price

The probability analysis in Part I revealed that price (i.e. the rate charged, or in the case of own transport, the average cost of operating) was not an important influence on the choice of mode. This was particularly true of the choice between professional operators, for example, road haulage and rail.

In the present chapter the information collected on the difference between the price paid by the manufacturer for transporting a consignment and the charge by alternative modes to the one actually used is treated in tabular form and an analysis is also given of those cases where the consignor had no specific knowledge of the charge by alternative modes.

**Knowledge of alternatives**

One-third of the firms in the General Survey and nearly one-half in the Commodity Survey knew the costs by alternative modes for some or all of their consignments. The proportions of actual consignments for which the alternative charges were given were somewhat lower however, being one-quarter in the General Survey and just under one-third in the Commodity Survey<sup>1</sup>.

The incidence with which alternative charges were known for individual consignments differs according to the mode used, and as Table 43 shows, where a consignment is sent by rail there is a significantly greater chance of the shipper knowing the charges by an alternative mode than if it is sent by any other mode.

The Table also shows that the proportion of consignments going by own transport for which the cost by alternative modes is known is not very different from the proportions for road haulage and G.P.O. (22 per cent compared with 28 per cent and 23 per cent).

**Table 43: Knowledge of charges by alternative modes**

| Mode used         | Number of consignments                       |  |                                 |  |
|-------------------|--|--|---------------------------------|--|
|                   | 1<br>Cost of<br>alternative<br>mode<br>known | 2<br>Cost of<br>alternative<br>mode<br>not known | 3<br>Total<br>consign-<br>ments | 4<br>Col. 2 as<br>percent of<br>Col. 3 |
| Own vehicle       | 287  | 734  | 943                             | 22                                     |
| Caravan's vehicle | 17   | 43   | 100                             | 17                                     |
| Road haulier      | 233  | 597  | 830                             | 28                                     |
| Rail              | 118  | 126  | 274                             | 43                                     |
| G.P.O.            | 73   | 233  | 304                             | 23                                     |
| Other             | 1  | 13   | 14                              | 7                                      |
| Total             | 609  | 1,834  | 2,443                           | 26                                     |

Source: General Survey.

<sup>1</sup> In the General Survey information was obtained for a sub-sample consisting of 1,483 consignments and costs by alternative modes were known for 645; the corresponding figures in the Commodity Survey were 2,583 and 937.

Where the charges by alternative modes were not known it is important to throw light on the reasons for the use of the mode selected. An examination of the special features in the consignment note should give an indication of some of the factors that will make the choice of one mode imperative but except in the case of transport on own account, large proportions of these consignments had no special features, the proportions being nearly one-half in the case of road haulage, and two-thirds for both rail and G.P.O. This lack of special features probably means that frequently the shipper is not restricted to one mode but only has a general idea of the charge by alternative modes and does not have this information for specific consignments as was requested. Shippers sending train-load traffic, for example, know that rail is the best way of sending this traffic but would not know the exact charge if sent by road.

Even where special features occur this does not mean that all of those mentioned in the consignment note necessitate the use of a particular mode—advertising, for instance, certainly does not limit choice of mode, but if an extra service is carried out or if a consignment is required urgently this could limit the choice of mode. An examination of the features that could necessitate the use of a particular mode (see Table below) shows that in the case of transport on own account a substantial proportion of consignments had features which could well have ruled out the use of any other mode. For road haulage the proportion is rather low and for rail and G.P.O. it is extremely low.

**Charges by alternative modes**

The results of this inquiry also yielded some interesting information on the extent to which consignments are sent by the

**Table 44: Special features relating to consignments where charge by alternative modes is not known**

| Feature           | Percentage  |              |      |        |
|-------------------|-------------|--------------|------|--------|
|                   | Mode used   |              |      |        |
|                   | Own vehicle | Road haulier | Rail | G.P.O. |
| Indivisible load  | —           | —            | —    | —      |
| cannot go by rail | 3           | 1            | —    | —      |
| Special body      | 4           | 4            | —    | —      |
| Inter-estate move | 17          | 7            | 3    | 2      |
| Local delivery    | 52          | 16           | 2    | 13     |
| Perishable        | 15          | 1            | 4    | —      |
| Urgent            | 39          | 13           | 20   | 12     |
| Extra service     | 12          | 6            | 1    | —      |
| Advertisement     | 95          | 35           | 16   | 5      |
| None              | 6           | 45           | 67   | 71     |

Source: General Survey.

Note: Some consignments had more than one special feature, thus percentages do not total 100.

cheapest mode. This analysis could only apply to those consignments sent by professional operators since the cost of individual consignments by own account transport was not collected—mainly because most 'C' operators would not be able to supply the information, except perhaps on the basis of an average for all consignments.

The figures show that over one-quarter of the consignments in the General Survey were sent by modes that were more expensive than the cheapest alternative. It has been suggested that many shippers will use expensive modes because of quality of service factors attached to them, and although an examination of the special features pertaining to particular consignments shows that over two-thirds of the consignments not sent by the cheapest mode in the General Survey had no special features in the consignment note, only one-tenth of these consignments had neither a special feature in the consignment note nor a subjective assessment on the importance of quality of service in the general questionnaire.

An examination of the General Survey shows that where the cheapest mode was not used there were approximately as many instances found of the consignments going by rail as by road haulier even though the proportion of consignments in the General Survey sent by road haulier was greater than for rail. Also shippers were prepared to pay substantially more for the quality of service pertaining to a particular mode, with nearly one-third of the consignments not sent by the cheapest form of transport being sent by a mode that was over 25 per cent more expensive than the cheapest.

In the Commodity Survey two-fifths of the consignments sent by a mode that was not the cheapest incurred transport charges that were more than 25 per cent greater than those of the cheapest mode: in Chemicals and Iron and Steel the proportion was similar to the General Survey, i.e. one-third, but in the other three industries about half of these consignments incurred charges 25 per cent greater than those of the cheapest alternative. It appears, therefore, that in industries like Food-stuffs and Electronics a substantial number of shippers are prepared to meet relatively high charges in order to obtain a high quality of service.

In summary, therefore, the foregoing analysis shows that for between a quarter and a third of consignments made by manufacturing industry, the cost of carriage by an alternative mode to the one used is known to the shipper. In such cases, however, it was found that a substantial proportion of consignments are not sent by the cheapest mode. Where the cost of the alternative is not known, the relevant consignments were examined to see whether they had any special features attaching to them which made the choice of the mode used imperative. The result of this analysis showed that in the case of consignments by own road vehicles special features were indicated on the majority of those which could well have meant that there was no alternative to the shipper's own vehicles. In those cases where other modes were used a high percentage of the consignments had no special features. This lack of special features attaching to consignments going by professional operators for which the cost of sending by alternative modes is not known, does not necessarily mean, however, that the shipper is acting irrationally when he does not seek knowledge of the cost of the alternative, since (a) he may have a general idea of the charge by alternative modes but does not have this information for specific consignments as was requested, (b) although a consignment may lack special features, differences between modes in quality of service may still make the choice of the mode used imperative.

Table 45: Consignments by professional operator not going by cheapest mode analysed by mode and difference in charges

| Mode used    | Cheapest alternative | Percentage by which alternative mode is cheaper |      |       |       |       |
|--------------|----------------------|---|------|-------|-------|-------|
|              |                      | Less than 5                                     | 5-14 | 15-25 | 25-49 | 50-75 |
| Road haulier | Rail                 | 5   | 17   | 14    | 7     | 2     |
| Rail         | Road haulier         | 7   | 7    | 7     | 10    | 8     |
| Other        | Road haulier         | 1   | 5    | 9     | 6     | 2     |
| Road haulier | Other                | 1   | 4    | —     | —     | —     |
| Rail         | Other                | —   | 2    | —     | —     | —     |
| Air          | Other                | —   | —    | —     | —     | 1     |
| All modes    |                      | 14  | 35   | 30    | 23    | 23    |

Source: General Survey

Note: It should be noted that the table applies to all sizes of consignment dispatched by professional operators. Different results may be obtained if the analysis is restricted to a particular consignment size group and further work on this is being undertaken.

## Damage and losses

Two reasons often suggested for users' preference for a particular mode of transport compared with another are freedom from losses and low incidence of damage. For example, the report on the 'Survey of V.C. licensed vehicles' (R.A.T.A. 1959) states:

'The relatively high number of votes cast under the heading of damage, breakage, etc., emphasises the value of V.C. licensed vehicles in reducing breakage, damage and to a lesser extent pilferage. Not only is this of real advantage, saving much expense and perhaps friction with a customer, but also time spent on claims in respect of the loss or damage is reduced to a minimum. The cost of recovering and repairing or replacing a rejected article can be so disproportionately high that the virtual elimination of damage by the use of the trader's own vehicles and staff may, in some instances, become the predominant factor in his choosing to use them.'

From the information yielded by the present survey, it may at first appear that these two factors have been over-rated as determinants of choice of mode of transport. Taking total damage despatched as a measure of the importance of a respondent, the proportion of establishments which cited low damage or loss as first reason for choice of mode of transport amounted to only about 2 per cent of the total. And, the information obtained from the consignment sample on actual damage or losses incurred appears to support the relative unimportance of these two factors, since out of 64,000 consignments on which the General Survey was based only 188 were reported lost and out of 16,600 consignments for which the relevant information was available\*, only 151 were damaged. Similar low proportions prevailed in the Commodity Survey, except that because of the inclusion of electronic goods and certain chemicals which are above average in susceptibility to damage, the percentage damaged was 3 per cent.

But, although in the *ex post* situation damage and losses are very infrequent, this cannot be taken to signify that in the *ex ante* situation, when decisions on transport are being made, the possibility of damage or loss does not feature in the decision making process. It has been argued in Part I that because shippers have allocated consignments to those modes of transport that are least likely to damage or lose them, these low incidences of damage and loss reflect shippers' rational choices. If this is the case, damage and loss could still be an important influence on modal choice.

On the other hand, the subjective assessments 'freedom from damage' and 'freedom from loss' did not appear as important factors in the probability analysis in Part I, but the same type of qualification could apply (although it carries less weight in this connection), *ie.* that shippers had become so accustomed to low damage and losses that they do not think of them as important.

On balance, therefore, the most that can be said on the basis of the results of the present survey is that damage and losses occur relatively infrequently and this has led most transport users to regard these factors as not being particularly prominent in choice of mode of transport. In a different situation where damage or losses are more frequent, or if there was a change in the situation in Britain, freedom from damage and freedom from losses could be a more significant influence on modal choice.

### Damages

The question of the influence of damage and losses on modal choice apart, it would be informative to examine the incidence of damage and losses of consignments in some detail. Analysis of the 151 consignments reported damaged in the General Survey shows that 38 were transported by own road vehicle, 6 by customers own vehicle, 32 by haulier, 61 by rail and 14 by the postal services. As a percentage of the total number of consignments moved by each means of transport, the proportions were 1 per cent, 6 per cent, 1 per cent, 2 per cent and 4 per cent respectively. Thus, on first inspection, it would seem that consignments carried by customers own vehicle and rail borne consignments were more frequently damaged than consignments by the other means of transport.

Incidence of damage can be expected to vary according to the commodity involved however, and indeed for some goods, for example, iron and steel products, coal, building materials, non ferrous metals, not a single consignment was reported damaged or spoilt. Damage was also negligible in consignments of chemicals and allied products and it amounted to less than 1 per cent in consignments of processed foodstuffs. On the other hand, the commodities which constitute the crude materials group were above average in susceptibility to damage (or perishability or spoilage) while the commodities most frequently damaged were building materials and electrical goods—damaged consignments accounting for about 4 per cent of all consignments made; more than four times higher than the average for all commodities.

Given this variation between commodities in proportion damaged, before a valid assessment can be made of one means of transport's record with respect to damage compared with another, the type of commodity most commonly consigned by each mode must be allowed for. For example, customers' collection involved a very high (relative to other means of transport) proportion of consignments damaged but, relative to other transport media, a large proportion of commodities moved in customers' vehicles consisted of crude materials and building materials so that if the above average incidence of damage amongst these two commodities is allowed for, the percentage of consignments damaged when carried by customers' vehicle is not significantly higher than by road haulage or own transport vehicles. Similarly, if this discounting pro-

\* The data relating to damaged consignments was collected from the consignees and the response rate was considerably lower than that obtained for the data supplied by the consignors.

cedure is applied to the postal services, its record becomes slightly less favourable since it handles a relatively low percentage of the damageable commodities while, for the same reason plus the fact that it handles a relatively high proportion of iron and steel products (which had zero incidence of damage) rail's record worsens slightly.

Another influence, although a fairly minor one, on incidence of damage is weight of consignment. The lightest consignments of less than 22 lbs are the least likely to be damaged, but for almost all other consignment sizes, the proportion damaged was about the same—except perhaps the weight group half to one ton where in both public haulage and transport on own account there was a distinct jump in proportion damaged. This was not due to a clustering of highly damageable commodities in this group; therefore, the cause is either sampling error or a real tendency for this consignment size to be found troublesome by road transport. Unfortunately, the number of observations is very small and the first cause is a distinct probability.

Two other factors were examined with the view to determining their influence on incidence of damage amongst consignments, i.e., length of haul and regularity of consignment, and although the evidence was insufficient to prove that journey length significantly affects the damage rate, in the case of road haulage and own account transport the proportion reported damaged amongst consignments described as irregular was higher than for regular movements.

Table 46: Proportion of consignments damaged

| Means of transport  | Percentage |
|---------------------|------------|
| Own vehicle         | 1.1        |
| Customer collection | 3.8        |
| Road haulier        | 6.7        |
| Rail                | 2.0        |
| Postal services     | 0.3        |
| All modes           | 1.9        |

Table 47: Proportion damaged\*, analysed by commodity

| Commodity                                      | Per cent |
|--|----------|
| Foodstuffs                                     | 1        |
| of which, bacon, meat, fruit and veg. products | 3        |
| Crude materials                                | 14       |
| Chemicals                                      | 9        |
| of which, heavy chemicals and dyestuffs        | 6        |
| Building materials                             | 4        |
| Iron and Steel                                 | —        |
| Non ferrous metals                             | —        |
| Electrical goods                               | 4        |
| of which, audio and electronic equipment       | 38       |
| Transport vehicles and equipment               | 15       |
| Metal measurements                             | 9        |
| Other manufactured goods                       | 9        |
| of which, paper and paper products             | 32       |
| All commodities                                | 1        |

Source: General and Commodity Surveys. The all commodity figure is derived from the General Survey only, however.

\* Includes spoil.

In summary therefore, it would appear that the biggest factor of damaged consignments is the type of commodity carried. Building materials (which include pottery and glass) in particular are very susceptible to damage but even in the case of this commodity damaged consignments amounted to only about 4 per cent of all consignments of the commodity handled. Increased size of consignment can affect the risk of damage but only in the sense that the smallest consignments of under 22 lbs are the most damage free; thereafter increased size is not really an important influence. Regularity is fairly important particularly in road transport where irregular consignments have a higher damage record than more regular ones.

After removing the influence of commodity, and indeed of regularity and consignment size since these also have a marginal influence on incidence of damage, the conclusion is that there is nothing to choose between road haulage and own account transport with regard to freedom from damage. The railways have a rather worse record than the other forms of inland transport with damaged consignments accounting for 2 per cent of all consignments handled. The postal services have the least number of damaged consignments. As regards the railways, however, it should be noted that the present data was collected at a time when the freight liner services were in their early stages of development. Growing use of this particular rail service, with the greater freedom from damage which containerisation offers, should lead to a reduction in the proportion of consignments damaged when carried by rail.

## Losses

Unlike damage, losses of consignments are not influenced by the type of commodity carried, the regularity with which the consignment was made, nor the length of the journey. The only factor that probably has some bearing on the risk of losing a consignment is its size, but even here the risk has to be fairly large to be over one ton, before the risk decreases significantly. Undoubtedly, the biggest cause of variation between modes of transport in proportion of consignments lost is the quality of service given by the modes themselves. The best, in terms of least losses, is the O.R.O.'s parcels service with only about 0.05 per cent of all consignments reported lost. Transport on own account had 0.1 per cent reported lost, road haulage, 0.6 per cent and rail, 0.8 per cent.

Table 48: Proportion of consignments lost

| Means of transport  | Percentage |
|---------------------|------------|
| Own vehicle         | 0.1        |
| Customer collection | 0.0        |
| Road haulier        | 0.6        |
| Rail                | 0.8        |
| Postal services     | 0.05       |
| All modes           | 0.3        |

Source: General Survey.

After allowing for the propensity of smaller consignments to be lost more frequently than larger ones, the O.R.O. still has the smallest proportion reported lost and own account transport has the next smallest. Road haulage's record is worse than rail for the small consignments of up to about half a ton, but for larger consignments rail's record becomes the worst. It seems to be a feature of road transport—haulage and own account—

that losses of the large consignments of over one ton are extremely rare (none were reported in the present survey). Losses of consignments over one ton were reported for rail, but it is possible that some of the larger rail borne consignments reported lost for the purpose of the present survey did in fact turn up at the consignee premises after the last interview had occurred with the consignor (who gave the information on numbers of consignments reported lost).

Table 49: Proportion lost, analysed by consignment size and means of transport

|           |          | Percentage   |               |      |                 |
|-----------|----------|--------------|---------------|------|-----------------|
| Over      | Not over | Over vehicle | Road trailers | Rail | Postal services |
|           | 22 lbs   | 0.4          | 0.8           | 0.7  | 0.05            |
| 22 lbs    | 112 "    | 0.3          | 0.4           | 0.2  |                 |
| 112 "     | 500 "    | 0.4          | 0.9           | 0.2  |                 |
| 500 "     | 2249 "   | 0.2          | 0.5           | 1.2  |                 |
| 1 ton     | 5 tons   | 0.0          | 0.0           | 3.0  |                 |
| 5 tons    |          | 0.0          | 0.0           | 0.0  |                 |
| All items |          | 0.1          | 0.6           | 0.8  | 0.05            |

Source: General Survey.

## Use of containers and pallets

Part of the questionnaire relating to the consignments dispatched by manufacturing industry was concerned with the use made of containers, pallets or other handling device and, from the replies received, a useful insight is provided into the frequency with which containers etc were used in 1966, and of the type of consignment on which they were most commonly employed.

In manufacturing industry, taken as a whole, it would appear that containers were used on about 6 per cent of all consignments made, pallets were used on 4 per cent of all movements, while on about 5 per cent of consignments some other device was used. These results emerge from the General Survey which, with its unbiased mix of commodities gives the more representative picture. The proportions revealed by the Commodity Survey gave a very similar figure for the use of containers but because, as it transpired, the latter survey included one of the more commonly palletised commodities, a higher figure was obtained for the use of pallets (8 per cent) and a rather lower one for the use of other devices (4 per cent).

The frequency with which these handling devices are used shows considerable variation between types of commodity, size of consignment and mode of transport, however, so that any assessment of the incidence of containerisation etc, must take account of each of these characteristics of transportation. This is done in the sections that follow.

### Containers

Containerisation has been defined as the technique of using containers or boxes, built to standards and range of dimensions, into which goods are packed by a manufacturer and where they remain unattached until unpacked by the customer. The word has become common parlance and is frequently found in transport magazines and journals. This fact was relied upon during the present survey and a specific definition of what is and is not a 'container' was not given on the questionnaire; the respondent's commentaries in interpreting the question was heavily relied upon. This practice has proved satisfactory for all manufacturing activities except perhaps the foodstuffs group where, when the food is in its raw state, the task of defining containers becomes most difficult, eg how large or how sophisticated in construction does the conventional tea chest have to become before it is classed a 'container'? Nevertheless, despite classification difficulties, it is not believed that the results of the question on use of containers are seriously inaccurate even in the food industry.

The data on containerised traffic shows that in 1966 over half of the consignments involving the use of a container were moved by road vehicles operated on own account, nearly 30 per cent were handled by road hauliers and 13 per cent went by rail. Relative to the total number of consignments (containerised and non-containerised) each mode handled, however, containers were used most frequently by the road haulier—one

in every twelve consignments, compared with one in fifteen by rail and one by transport.

All sizes of consignments were handled in containers, but the most common size was in the 23 lbs to quarter ton (560 lbs) range. On the other hand, a high proportion of consignments, whether containerised or not, are in this weight group, and relative to the total number of consignments in each size group, the size which most frequently involved use of a container was the group quarter to half ton, where about 1 in 5 consignments were containerised. This represents the average for all commodities and all modes of transport and because of the variation that occurs it is not perhaps a very useful statistic. For example, although the most commonly containerised consignment (relative to the total number of such consignments) in transport by own vehicle occurred in the quarter to half ton range, in road haulage it was in the 23 lbs to 1 cwt and  $\frac{1}{2}$  to 1 ton ranges, and by rail in the quarter to half ton and  $\frac{1}{2}$  to  $\frac{3}{4}$  ton ranges. The variation by commodity is also large with some industries, for example, ferrous and non ferrous metal, showing the greatest incidence of containerisation for their largest consignments; others, such as those producing building materials, moving mainly small consignments in containers.

Of all influences on degree of containerisation it is probable that, in 1966, the commodity involved was the most important.<sup>1</sup> Thus, the General Survey showed that while 15 per cent of all consignments of building materials, 12 per cent of metal manufactures and 8 per cent of foodstuffs were containerised, only 5 per cent of consignments of electrical goods and 1 per cent of chemicals were moved in containers.

The difference between commodities in degree of containerisation is supported by the findings of the Commodity Survey which showed that of the five commodities selected for detailed study, containers were commonly used only in the bacon curing, meat, fish and vegetable processing group, where they were employed in one out of every five consignments, compared with about one in fifteen for iron and steel products and electronic goods and one in fifty for chemicals and paper products. In the bacon curing, etc group, almost all containerised movements (as of all movements) occurred by own vehicles, but the most common size of consignment was very small; less than 112 lbs suggesting multiple consignments per container and perhaps to a certain extent a misinterpretation of what was meant to be classified as a 'container'. Furthermore, the types of industry studied within the foodstuffs group—the bacon curing, meat, fish, fruit and vegetable products, are probably not representative of all food and drink industries in terms of size of consignment. Thus, the results of the General Survey are probably more indicative of the most common size of containerised consignments in the food industries as a whole, ie between  $\frac{1}{2}$  and 1 ton, where consignments in containers formed as much as 25 per cent of all such consignments.

<sup>1</sup> See over

In iron and steel, almost all consignments involving use of a container were handled by rail, the most common size was between 5 and 7½ tons and containerised consignments accounted for about a third of all consignments of that size. In chemicals, nearly 50 per cent of the containerised consignments were

handled by own transport and 30 per cent by road haulier; size of consignment was mainly in the 1 to 7½ tons range and towards the end of that range (5 to 7½ tons) containerised movements were about 5 per cent of all movements. In the electronic equipment industry some 50 per cent of the containerised movements were handled by own transport but in the paper industry almost all containerised movements were by road haulier; in both industries size of containerised consignment was very small being less than 500 lbs.

Table 50: Consignments on which containers were used

| Commodity                        | Number of consignments | Containerised consignments as percentage of all consignments |
|----------------------------------|------------------------|--|
| Foodstuffs                       | 1,290                  | 8  |
| Crude materials                  | 160                    | 5  |
| Chemicals                        | 20                     | 1  |
| Building materials               | 540                    | 15   |
| Iron and steel                   | 70                     | 4  |
| Non-ferrous metals               | 40                     | 4  |
| Electrical goods                 | 160                    | 5  |
| Transport vehicles and equipment | 130                    | 5  |
| Metal manufactures               | 370                    | 12   |
| Other manufactures               | 1,280                  | 5  |
| All commodities                  | 4,000                  | 6  |

Source: General Survey.

\* Variance analysis shows that the effect of type of commodity on incidence of containerisation is almost twice as large as that of size of consignment. The residual variance is large, however, suggesting the influence of other factors and/or the influence of both commodity and consignment size combined.

## Pallets

The largest number of consignments involving the use of pallets occurred by own road transport and road haulage but, as in the case of containers, a high proportion of all consignments, whether palletised or not, were handled by own vehicles. Relative to the total number of consignments handled, pallets were most frequently used by the road haulier—on about 1 in 14 consignments compared with 1 in 30 by own transport and 1 in 100 by rail.

The most frequent size of a palletised consignment was in the 1 to 5 tons range but after allowing for differences in total numbers of consignments in each weight group, the highest proportions were found in the 1 to 5, 5 to 7½ and over 10 tons weight categories where 1 in every 4 to 5 consignments involved the use of pallets.

Again, however, this is partly a reflection of the type of commodity which is most frequently moved on pallets. Foodstuffs, particularly processed foods, formed nearly half a of the total number of palletised consignments picked up in the General

Table 51: Containerised consignments: analysis by size of consignment and mode of transport

| Industry                        | (a) Size            |     |             |     |              |     |                |     |         |     |     |     |       |     | All sizes* |  |
|---------------------------------|---------------------|-----|-------------|-----|--------------|-----|----------------|-----|---------|-----|-----|-----|-------|-----|------------|--|
|                                 | Over Not over ½ ton |     | ½ ton 1 ton |     | 1 ton 5 tons |     | 5 tons 10 tons |     | 10 tons |     |     |     |       |     |            |  |
|                                 | (a)                 | (b) | (a)         | (b) | (a)          | (b) | (a)            | (b) | (a)     | (b) | (a) | (b) | (a)   | (b) |            |  |
| Foodstuffs (M.L.H. 354 and 210) | 4,740               | 28  | 30          | 2   | 33           | 2   | 33             | 1   | —       | —   | —   | —   | 4,830 | 32  |            |  |
| Chemicals (M.L.H. 271)          | 130                 | 1   | 40          | 2   | 96           | 2   | 196            | 4   | 150     | 4   | 88  | 2   | 790   | 2   |            |  |
| Iron and steel (M.L.H. 301)     | 72                  | 3   | 30          | 3   | 250          | 13  | 330            | 8   | 1,360   | 30  | 183 | 2   | 2,430 | 7   |            |  |
| Electronics (M.L.H. 364)        | 760                 | 4   | 20          | 3   | 20           | 4   | 20             | 2   | —       | —   | —   | —   | 910   | 6   |            |  |
| Paper products (M.L.H. 481-483) | 640                 | 3   | 10          | 1   | —            | —   | 10             | —   | 80      | 6   | —   | —   | 750   | 2   |            |  |

\* Including not known consignment sizes.

(a) = numbers of consignments.

(b) = containerised consignments as per cent of all consignments.

| Industry       | (b) Mode of transport |     |              |     |       |     |            |     |
|----------------|-----------------------|-----|--------------|-----|-------|-----|------------|-----|
|                | Own account           |     | Road haulier |     | Rail  |     | All modes† |     |
|                | (a)                   | (b) | (a)          | (b) | (a)   | (b) | (a)        | (b) |
| Foodstuffs     | 4,740                 | 31  | 40           | 1   | 33    | 1   | 4,830      | 32  |
| Chemicals      | 370                   | 3   | 330          | 2   | 40    | —   | 790        | 2   |
| Iron and steel | 190                   | 4   | 350          | 3   | 1,900 | 20  | 2,630      | 7   |
| Electronics    | 420                   | 6   | 190          | 10  | 30    | 9   | 910        | 6   |
| Paper products | 40                    | —   | 690          | 4   | 30    | 1   | 750        | 2   |

Source: Commodity Survey.

† Including coastal shipping, customer collection, inland waterway.

(a) = numbers of consignments.

(b) = containerised consignments as percent of all consignments.

Survey and the only other commodities fairly commonly palletised were chemicals, building materials and transport vehicles and equipment. Relative to all consignments made, whether palletised or not, chemicals and foodstuffs retain their ranking with palletised movements forming about a tenth of all movements, but in the case of building materials and transport equipment consignments on pallets formed about 5 per cent of all consignments made.

Table 52: Consignments on which pallets were used

| Commodity                        | Number of consignments | Palletised consignments as percentage of all consignments |
|----------------------------------|------------------------|---|
| Foodstuffs                       | 1,250                  | 8   |
| Crude materials                  | 40                     | 2   |
| Chemicals                        | 450                    | 11*   |
| Building materials               | 140                    | 4   |
| Iron and steel                   | 40                     | 2   |
| Non-ferrous metals               | 20                     | 2   |
| Electrical goods                 | 20                     | 1   |
| Transport vehicles and equipment | 140                    | 5   |
| Metal manufactures               | 10                     | —   |
| Other manufactures               | 220                    | 2   |
| All commodities                  | 3,630                  | 4   |

Source: General Survey.

\* Sampling error fairly large

The more detailed information in the Commodity Survey, which included a foodstuffs industry, revealed that pallets are almost exclusively used on consignments of processed foods; rarely on raw foodstuffs. Moreover, the incidence of palletisation is very high; of some 22,600 consignments of processed foods despatched by the bacon curing, fish, meat, fruit and vegetable processing industries, pallets were used on no fewer than 5,000 of them. Most of these consignments were handled by road haulage and indeed as much as six in every ten of the movements of this type of foodstuff by the haulier involved the use of a pallet—a very high degree of palletisation and a factor which helps explain why the haulier ranks highest in proportion of consignments palletised. As regards size, although about 60 per cent of the palletised consignments of processed foods were fairly evenly distributed over the weight groups between a quarter ton and 5 tons, relative to the total number of consignments, the highest incidence of palletisation was found in the weight groups over five tons, where about 80 per cent of the movements involved the use of pallets.

Although the General Survey showed that pallets were fairly commonly used for the transport of chemicals, the Commodity Survey showed a much lower percentage (5 per cent compared with 11 per cent). The number of observations upon which the General Survey's results for this industry are based is rather small and therefore sampling error is probably fairly large. On the other hand, the Commodity Survey was restricted to the chemicals and dyestuffs section of the industry, where use of pallets is probably less common.

Amongst manufactured goods, use of pallets is not very common. For some manufactures, *eg* electronics, the proportion palletised is less than 1 per cent, amongst others, *eg* paper products, transport vehicles and equipment, it is about 5 per cent. However, although the incidence of palletisation is not

high, it is interesting to note that in the weight ranges of one ton and over about one in five consignments of manufactured goods were palletised and of the palletised consignments a high proportion was handled by road haulage. The greater incidence of palletisation in the higher weight ranges is also true of chemicals and iron and steel; about one in seven consignments of chemicals in the size group 1 to 7½ tons was on pallets and about one in ten of the iron and steel movements of ten tons or more.

#### Other devices

Other devices are relatively infrequently used and although some 3,000 movements involving a handling device other than a pallet or container were picked up in the General Survey, almost all of these concerned the carriage by rail of small consignments of manufactured goods. The Commodity Survey revealed that 'other' devices were used occasionally on consignments of each of the commodities studied, but they were fairly frequently used only in the carriage of small consignments of foodstuffs by own vehicle and the movement of large consignments of iron and steel by road haulier.

To summarise, one of the main influences on containerisation and palletisation of consignments appears to be the type of commodity involved. Size (weight) of consignment is also an important factor, but because of ability to bulk consignments, very small movements can be handled by these special devices while there appears to be few constraints on their ability to handle medium sized and large consignments of up to 10 tons or more. In 1966, the most palletised commodities were chemicals and processed foodstuffs, the most containerised, building materials with metal manufactures second and foodstuffs third. Since the various modes of inland transport have different shares in the total movement of particular commodities, comparisons of degree of containerisation or palletisation between modes tend mainly to reflect this factor rather than differences between modes in their adoption of special handling devices. This is borne out by the probability analysis in Part I which shows that after allowing for all relevant factors (such as type of commodity handled), use of containers, for example, only slightly increases the probability of carriage by professional operators compared with own transport.



## Journey time

Although journey time was one of the factors considered in the analysis in Part I, it did not emerge as a significant factor in determining the distribution of traffic between modes. This was not an unexpected result, even though 'speed' was considered important in choice of main mode by sight in every ten manufacturers. The answer lies in the fact that the information on time taken for delivery yielded by the consignment sample represents the situation after the decision on choice of mode has been taken. For example, if speed is required, shippers may well have only sent that traffic by a particular mode which that mode can transport quickly and where modes have been considered to have a poor record with regards to speed when carrying certain types of traffic, they have not been used. This selecting of a mode is seen, for instance, in parcels traffic where the extremely speedy c/o/Rail services carry most of the traffic and for journeys other than local delivery almost all of it.

Thus, from the present survey results an unqualified assessment of the importance of journey times in choice between modes cannot be made, but the results, although representing the 'ex post' situation, are of themselves extremely interesting since the authors are not aware of any systematic attempt to measure the performance, in this respect, of one mode of transport compared with another.

In the present enquiry information was collected on the time taken for consignments by various modes of transport to reach their destination. The results are summarised in the graphs and table 53 below. These represent only a first appraisal however—there are very good reasons why some modes should, at first glance, do better than others, but first a brief description of what the figures display.

Perhaps the most marked feature of the distribution of consignments by time taken when handled by each of the main modes of transport is the very high proportion of same day deliveries of consignments carried by 'C' licence vehicles (nearly 60 per cent of the total handled); the equivalent proportion by haulier is only about 30 per cent and by rail it is less than 10 per cent. Delivery on the day after despatch occurs for about the same proportion of consignments by each mode except GPO which has a peak in next day deliveries, and the same is true for those consignments which are delivered on the second day after despatch. By the third day, most (nearly 90 per cent) of the consignments handled by own vehicles and GPO have been delivered. The haulier and the railways still have a significant proportion undelivered even after the third day however (55 per cent for rail, 30 per cent for the haulier), and the railways' showing relative to that of the haulier does not worsen significantly until after the fifth day, by which time the haulier has only 10 per cent undelivered while the railways have nearly 30 per cent.

There is however a strong relationship between transit time and length of haul; obviously the longer the haul the greater the time taken for the consignment to reach its destination. Any comparison of transit times between modes must therefore take into account the most common length of haul for which each mode of transport is employed. The shortness of the haul by own transport vehicles has already been emphasised in the analyses in the earlier part of this book, so that it is hardly surprising to find such a high proportion of consignments carried by this mode constitutes same day deliveries. The same is true of the haulier to a less marked extent and, in comparison with rail, an added feature of road haulage is its concentration on

Table 53: Distribution of consignments by mode of transport and time taken

| Mode of transport | Delivery time: |                 |                              |           |            |           |           |                      | Percentage |
|-------------------|----------------|-----------------|------------------------------|-----------|------------|-----------|-----------|----------------------|------------|
|                   | Same day       | Next day        | On second day after despatch | Third day | Fourth day | Fifth day | Sixth day | Seventh day or later | Total      |
| Own road vehicle  | 59             | 16              | 13                           | 6         | 2          | 1         | 1         | 2                    | 100        |
| Road haulier      | 33             | 16              | 11                           | 9         | 8          | 14        | 5         | 4                    | 100        |
| Rail              | 9              | 14              | 12                           | 10        | 16         | 11        | 13        | 16                   | 100        |
| G.P.O.            |                | 47 <sup>1</sup> | 27                           | 14        | 5          | 2         | 2         | 3                    | 100        |
| All modes         | 31             | 18              | 17                           | 10        | 8          | 7         | 4         | 5                    | 100        |

Source: General Survey.

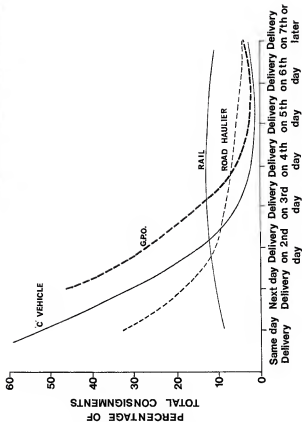
<sup>1</sup> Includes same same day deliveries.

medium and only fairly long hauls in many industries, while rail is often used for long and sometimes very long hauls.

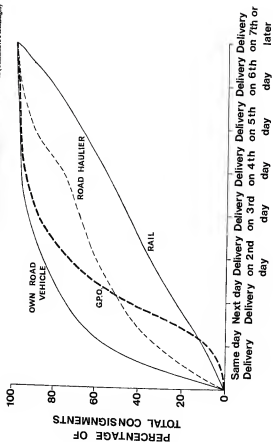
Bearing in mind these considerations, the findings described in the paragraph above have to be modified. After allowing for the very short hauls undertaken by "C" vehicles there is really little to choose between own transport and the haulier in their average transit time for most consignments, except perhaps a tendency for the haulier to have a slightly larger proportion of consignments still undelivered after the third day—which would tend to pull down his overall average compared with the own account vehicles. To some extent the same is true of the railways, but the comparison is complicated because of the variety of services the railways have on offer—some of which, like the passenger train parcel service, cater for fast delivery over long distances. By broadly averaging out over the types of services, there appears not to be a large difference between the railways and the road haulier except for the railways worse "tail", i.e. the undelivered portion after the third day. The latter is rather large relative to that of the other two forms of transport and it is possible that this "tail" is the cause of the generalisation which is sometimes made that the railways transit times are poor. But it may be that the relatively slow consignments occur on particular types of services or particular types of consignments. Also in some industries, slow transit time is perhaps unimportant. In general however this is the factor that lowers the railways overall performance regarding speed of delivery.

As regards the ORO, although some of its consignments do take up to three days for delivery, after taking into account the distances over which consignments are handled, it probably ranks highest of all modes of transport for speedy transit.

Graph 1 Analysis of Commitments by Mode and Time Taken (Percentages)



Graph 2 Analysis of Consignments by Mode and Time Taken (Cumulative Percentages)



## Ownership of transport facilities: influence on modal choice

The probability analysis showed that, on average and other things being equal, ownership of transport facilities such as 'C' licensed fleets, availability of vehicles under 'A Contract,' ownership of railway sidings, were not an important influence on the distribution of traffic between modes compared with the influence of other factors such as, in particular, length of haul.

In this Chapter this finding is analysed in a tabular form by considering, firstly, the degree to which concentration occurs on a particular mode, since if it is high then it looks as though some factor, *eg* ownership, is influencing the distribution of traffic. Secondly, the distribution of traffic between modes for establishments owning 'C' licensed fleets or private rail sidings is compared with the distribution by all establishments. Thirdly, the effect of group organisations on degree of diversity of use of modes is examined. Then, an examination follows on the use of professional operators by owners of 'C' licence fleets during their periods of peak demand. Finally, a brief account is given of the use of each professional operator by size of establishment and past and planned changes between modes are discussed.

### Diversity of modal choice

An interesting finding that emerges from the present survey concerns the diversity of transport modes used by individual manufacturing establishments. One fifth of establishments in the General Survey sent 50 per cent or less of their traffic, in terms of expenditure, by the most important mode they used<sup>1</sup>

and less than one-quarter of the establishments sent over 90 per cent of their traffic by one mode (see Table below).

The use of a number of modes is significantly more prevalent in the large and medium sized establishments, where 19 per cent and 24 per cent respectively sent half of their traffic or less by the main mode they used, than amongst the small establishments where the proportion is 15 per cent. The corresponding proportions for the Commodity Survey (23 per cent, 16 per cent and 9 per cent respectively) suggest, however, that nature of business is also an important factor in determining diversity of choice. Table 55 below, taken from the Commodity Survey shows that, for example, less than one-tenth of the establishments in the Foodstuffs industry sent half of their traffic or less by their main mode compared with one-fifth and one-quarter in the Chemicals and Iron and Steel industries respectively. This suggests, therefore, that it is the concentration of Foodstuffs establishments in the small size group that is causing the small diversity of modal choice in this size group in the Commodity Survey compared with the General Survey.

The large firms, which serve larger and more diverse markets than the small firms, have naturally a wider range of transport requirements, and as a result the use of a number of modes is significantly more prevalent for large than for small firms.

<sup>1</sup> 8 modes were differentiated: Firm own road vehicles; Customer vehicle; Professional road haulier; British Rail; Coastal shipping; Inland waterway; G.P.O.; Other. For definitions see Appendix 1.

Table 54: Expenditure on main mode as percentage of total expenditure on transport, analysed by size of establishment

| Size<br>(employees) | Percentage |       |       |       |       |       |       |       |        | Total |
|---------------------|------------|-------|-------|-------|-------|-------|-------|-------|--------|-------|
|                     | 1-20       | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | 91-100 |       |
| Over 499            | —          | 1     | 3     | 4     | 5     | 10    | 8     | 7     | 4      | 42    |
| Percent             | —          | 2     | 7     | 10    | 12    | 24    | 19    | 16    | 10     | 100   |
| 100-499             | 10         | 3     | 6     | 12    | 15    | 22    | 18    | 15    | 25     | 116   |
| Percent             | 8          | 2     | 5     | 9     | 12    | 18    | 14    | 12    | 20     | 100   |
| Under 100           | 1          | 1     | 4     | 8     | 12    | 5     | 11    | 13    | 32     | 87    |
| Percent             | 1          | 1     | 4     | 9     | 14    | 6     | 13    | 15    | 37     | 100   |
| Not known           | —          | —     | 1     | —     | —     | 1     | —     | 1     | 1      | 4     |
| Percent             | —          | —     | —     | —     | —     | —     | —     | —     | —      | —     |
| Total               | 11         | 5     | 14    | 24    | 32    | 38    | 37    | 36    | 61     | 259   |
| Percent             | 4          | 2     | 6     | 9     | 12    | 15    | 14    | 14    | 24     | 100   |

Note: Only 259 establishments gave details of expenditure analysed by mode.

Source: General Survey.

Table 55: Expenditure on main mode as percentage of total expenditure on transport, in selected industries

| Nature of business   | Percentage |       |       |       |       |       |       |       |        | Number of establishments |
|----------------------|------------|-------|-------|-------|-------|-------|-------|-------|--------|--------------------------|
|                      | 1-20       | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | 91-100 | Total                    |
| Foodstuffs           | —          | —     | 2     | 1     | 3     | 6     | 4     | 7     | 21     | 43                       |
| Percent              | —          | —     | 5     | 2     | 5     | 14    | 9     | 16    | 49     | 100                      |
| Chemicals            | 2          | 1     | 1     | 5     | 7     | 6     | 3     | 7     | 13     | 45                       |
| Percent              | 4          | 2     | 2     | 11    | 15    | 13    | 7     | 16    | 29     | 100                      |
| Iron and steel       | 1          | 1     | 4     | 3     | 3     | 6     | 5     | 4     | 10     | 27                       |
| Percent              | 3          | 3     | 11    | 8     | 8     | 16    | 13    | 11    | 27     | 100                      |
| Electronic equipment | 3          | —     | 1     | 4     | 9     | 9     | 10    | 6     | 9      | 51                       |
| Percent              | 6          | —     | 3     | 8     | 17    | 17    | 20    | 12    | 18     | 100                      |
| Paper                | 1          | —     | 3     | 1     | 7     | 8     | 14    | 16    | 28     | 81                       |
| Percent              | 1          | —     | 6     | 2     | 8     | 9     | 16    | 18    | 33     | 100                      |
| Total                | 7          | 2     | 13    | 23    | 28    | 35    | 36    | 43    | 82     | 364                      |
| Percent              | 3          | 1     | 5     | 8     | 10    | 13    | 14    | 15    | 31     | 100                      |

Source: Commodity Survey.

## Ownership of transport facilities

## Private fleets

The 'empire building' argument has long been prevalent in discussions on this subject; this is the tendency of transport managers to build up fleets of own vehicles and to use these exclusively regardless of the costs of operation. The Table below gives details for the General Survey of the importance of own vehicle operation in total transport operation for firms owning their own fleets.<sup>1</sup> The proportion of establishments (17 per cent, 34 per cent and 50 per cent for large, medium and small establishments respectively) using their own fleets for shipping more than 80 per cent of their traffic in terms of tonnage gives little foundation for the 'empire building' argument. And although one must be careful in comparing these tonnages with the previous expenditure figures these proportions are very similar to those for expenditure on main mode by all establishments in the General Survey suggesting that ownership of a 'C' licence fleet does not lead to large differences in the use of various modes. Thus this illustrates the findings of the probability analysis.

Table 56: Proportion of total tonnage shipped which went by own vehicles for establishments owning such vehicles, analysed by size

| Size (employees) | Percentage |       |       |       |        | Number of establishments |
|------------------|------------|-------|-------|-------|--------|--------------------------|
|                  | 1-20       | 21-40 | 41-60 | 61-80 | 81-100 | Total                    |
| Over 699         | 11         | 3     | 7     | 7     | 4      | 36                       |
| Per cent         | 31         | 14    | 19    | 19    | 17     | 100                      |
| 300-699          | 23         | 10    | 9     | 17    | 30     | 89                       |
| Per cent         | 26         | 11    | 10    | 19    | 34     | 100                      |
| Under 300        | 3          | 8     | 1     | 6     | 25     | 52                       |
| Per cent         | 4          | 15    | 13    | 15    | 50     | 100                      |
| Not known        | —          | —     | 1     | 1     | 2      | 4                        |
| Total            | 34         | 23    | 23    | 33    | 64     | 381                      |
| Percent          | 36         | 13    | 14    | 18    | 35     | 100                      |

Source: General Survey.

Note: The figure of 381 does not agree with the figure in Table 50, p. 180 as not all establishments owning vehicles gave the necessary details on tonnage.

<sup>1</sup> The percentages given in the remaining Tables of this Chapter are based on tonnages and not on cost as was the case for the first two Tables. The reason for this change is that in Tables 54 and 55 a main mode had to be differentiated and this is better done in terms of expenditure than tonnage.

Nature of business has a bearing upon the number of modes used by an establishment. Nearly half of the establishments in the Electronic equipment industry and over half of the establishments in the Foodstuffs industry owning vehicles sent over 90 per cent of their traffic by them, compared with only a little over one-quarter in the Chemicals and Iron and Steel industries (see Table 57 below). In the General Survey the Chemical and Iron and Steel industries had similarly low proportions (25 per cent and 20 per cent respectively) and the only industry that sent over 60 per cent was the Foodstuffs industry (64 per cent). In the Foodstuffs industry the perishability of the product and the shortness of the hauls<sup>1</sup> explains the frequent use of transport on own account, and the high risk of damage in electronic goods similarly accounts for its importance in this industry. This illustrates, therefore, the findings of the probability analysis which showed that where Foodstuffs were shipped this increased the probability of carriage by 'C' licensed vehicles by 33 per cent, and the carriage of Iron scrap reduced the probability by 8 per cent.

Table 57: Proportion of total tonnage shipped which went by own vehicle for establishments owning such vehicles, analysis for selected industries

| Nature of business   | Number of establishments |       |       |       |        | Total |
|----------------------|--------------------------|-------|-------|-------|--------|-------|
|                      | 1-20                     | 21-40 | 41-60 | 61-80 | 81-100 |       |
| Foodstuffs           | 4                        | 2     | 3     | 8     | 19     | 36    |
| Per cent             | 11                       | 6     | 8     | 22    | 55     | 100   |
| Chemicals            | 20                       | 5     | 4     | 8     | 11     | 58    |
| Per cent             | 35                       | 13    | 11    | 33    | 39     | 100   |
| Iron and steel       | 8                        | 4     | 2     | 6     | 9      | 29    |
| Per cent             | 27                       | 14    | 7     | 31    | 31     | 100   |
| Electronic equipment | 4                        | 2     | 7     | 10    | 38     | 61    |
| Per cent             | 20                       | 5     | 17    | 34    | 64     | 100   |
| Paper                | 15                       | 9     | 9     | 9     | 23     | 65    |
| Per cent             | 23                       | 14    | 14    | 14    | 35     | 100   |
| Total                | 48                       | 22    | 25    | 43    | 90     | 228   |
| Per cent             | 20                       | 10    | 12    | 20    | 38     | 100   |

Source: Commodity Survey.

#### Private sidings and canal berths

As only 19 establishments in the General Survey had private rail sidings, and 5 canal berths, and of these only 12 and 1 respectively gave figures on tonnages shipped, the discussion of the influence of these facilities upon modal choice is confined to the Commodity Survey.

Even where establishments own private sidings very few of them send the bulk of their traffic by rail. Less than one-tenth of the establishments sent more than 60 per cent of their total traffic by rail and over three-quarters sent 20 per cent or less. As these proportions are not significantly different from those that occur for all users of the railway, it is irrespective of whether they own a siding (see Table 64) it can be concluded that ownership of a private siding does not have a great influence on the mode of rail.

Table 58: Proportion of total tonnage shipped which went by rail for establishments with private sidings

| Nature of business   | Number of establishments |       |       |       |        | Total |
|----------------------|--------------------------|-------|-------|-------|--------|-------|
|                      | 1-20                     | 21-40 | 41-60 | 61-80 | 81-100 |       |
| Foodstuffs           | 2                        | —     | 1     | —     | —      | 3     |
| Chemicals            | 15                       | 3     | 1     | 1     | —      | 20    |
| Iron and steel       | 11                       | 1     | 2     | 2     | —      | 16    |
| Electronic equipment | 1                        | —     | 1     | —     | —      | 2     |
| Paper                | 10                       | —     | —     | —     | —      | 10    |
| Total                | 39                       | 4     | 5     | 3     | —      | 51    |

Source: Commodity Survey.

Note: 30 of the 51 establishments with private sidings did not give information on tonnages shipped.

All owners of canal berths sent less than one-fifth of their traffic by inland waterways. But as was noted previously the main use of canal berths is for incoming traffic and as these tonnage figures only relate to outgoing traffic the proportion is bound to be very small.

#### Group policy

During the preliminary enquiries preceding the Survey it became apparent that a number of establishments belonging to larger organisations were not free to choose their own modes of transport but received instructions from the head office. A common transport policy may be adopted for all establishments in a group so that economies of scale in operation can be obtained if the use of a pooled 'C' licence fleet, or favourable terms from a professional carrier because of the large quantities shipped by the group. On the other hand, a number of establishments stated that the mode they were told to use was not in their opinion the best, and the long line of command undoubtedly leads to inflexibility in the decision making process. An aim of the Survey was, therefore, to establish if belonging to a group organisation reduced the flexibility in modal choice.

191 (33 per cent) of the establishments in the General Survey and 253 (30 per cent) in the Commodity Survey belonged to larger groups or organisations. These exceptionally high proportions suggest that the size bias in the two Surveys is having an influence, and also that the difference between the two Surveys is caused by the commodity bias in the Commodity Survey. An examination of the Table below bears this out, three-quarters of the large establishments belong to Groups compared with only a third of the small establishments, and the Commodity Survey shows that this is a more common feature in some industries than others.

15 per cent of the establishments belonging to Groups in the General Survey and 11 per cent in the Commodity Survey were not free to make their own choice of mode, there was, however, no tendency for these establishments to be significantly more prominent in some industries and size groups than others.

As might have been expected from the previous argument the proportion of establishments not responsible for modal choice having access to 'C' licence pools (one-fifth in both surveys) is much higher than the proportion for all shippers (one-twentieth in both surveys). And with only one exception, where a pool is used transport on own account is the main mode of transport,

<sup>1</sup> See Part III, Chapter 1. Foodstuffs manufacturers locate near the markets because of the perishability of their products.

**Table 59: Number of establishments belonging to Groups, analysed by size and Nature of Business**

| General Survey   |                                    |                                 | Commodity Survey     |                                    |                                 |
|------------------|------------------------------------|---------------------------------|----------------------|------------------------------------|---------------------------------|
| Size (employees) | Establishments belonging to Groups | Percent of total establishments | Nature of business   | Establishments belonging to groups | Percent of total establishments |
| Over 499         | 42                                 | 74%                             | Foodstuffs           | 38                                 | 73%                             |
| 100-499          | 103                                | 80%                             | Chemicals            | 47                                 | 70%                             |
|                  |                                    |                                 | Iron & steel         | 37                                 | 69%                             |
|                  |                                    |                                 | Electronic equipment | 43                                 | 85%                             |
| Under 100        | 42                                 | 34%                             | Paper                | 43                                 | 69%                             |
| Not known        | 4                                  |                                 |                      |                                    |                                 |
| Total            | 191                                | 59%                             | Total                | 233                                | 70%                             |

so that the suggestion previously put forward that where a vehicle pool is not used Groups enforce a common rule with respect to choice of a professional operator in order to reap economies of scale is strengthened.

Where a Group policy is enforced there is a reduction in the diversity of modes used, also—two-thirds of the establishments belonging to groups in the General Survey sent over 60 per cent of their traffic in terms of expenditures by their main mode compared with two-thirds of all establishments.<sup>1</sup> Group policy, therefore, serves to some extent to reduce flexibility in modal choice, but so long as the necessary economies can be reaped from large scale shipments this is a rational policy.

#### Use of public operators during peaks

A frequent complaint raised against operators on own account is that they do not keep sufficient capacity to meet peaks in demand and only when such peaks occur make use of public carriers.<sup>2</sup> The complaint rests on the grounds that if public carriers do not charge extra for peak users but average out the costs of the peak over the year then shippers who only send traffic by public carriers during peaks will be subsidised by those who use them all the year round. Evidence in Germany refuted this argument<sup>3</sup> but the large number of establishments in the UK which have their own vehicle fleets but also make use of public carriers warrants a closer examination of the question with respect to this country.

Sixty-two out of the 297 transport on own account operators in the General Survey stated that they did not have sufficient capacity to meet upward fluctuations in demand and used public carriers at such times, of these 38 gave information on tonnages shipped by all the modes of transport they used. An analysis of these 38 (see Table 60) shows that nearly half of the establishments sent 60 per cent or less of their traffic by their own fleets so they were clearly important users of public carriers at periods other than peak periods. In fact only one-third sent more than 60 per cent of their traffic by their own vehicles which is the same as for all transport on own account operators. This implies that the majority of shippers with their

own fleets who use public carriers during peak periods also use them during off-peak periods. The Table below shows a fairly similar distribution with respect to size to that encountered for all transport on own account operators.

**Table 60: Use of Public Carrier during peak periods by operators on own account**

| Size (employees) | Number of establishments                                 |       |       |         |         |       |
|------------------|--|-------|-------|---------|---------|-------|
|                  | Percentage of tonnage shipped which went by own vehicles |       |       |         |         |       |
|                  | 1-25   | 25-49 | 49-99 | 100-499 | 500-999 | Total |
| Over 499         | —  | —     | 2     | 3       | 1       | 7     |
| 100-499          | 4  | 1     | 5     | 6       | 6       | 22    |
| Under 100        | —  | 3     | 2     | 1       | 4       | 9     |
| Total            | 4  | 3     | 9     | 10      | 12      | 38    |

Source: General Survey.

The Commodity Survey shows a similar situation with about 40 per cent of the establishments using public carriers during peaks shipping more than 80 per cent of their traffic in their own vehicles. However, such operators in the Foodstuffs and Electronic equipment industries send much smaller proportions of their traffic by their own vehicles than is common for own account operators in these industries, whilst the Chemical, Iron and Steel and Paper industries make considerably more use of their own fleets. Nevertheless the proportion of operators in all these industries sending over 80 per cent of their traffic in their own vehicles is comparatively low and one can only conclude that they are frequent users of public carriers at times other than peaks.

There would appear, therefore, to be little evidence to support the argument that a large number of transport on own account operators make use of public carriers solely during peak periods.

**Table 61: Use of Public Carriers during peak periods by operators on own account in selected industries**

| Nature of business   | Number of establishments                                |       |       |         |         |       |
|----------------------|---|-------|-------|---------|---------|-------|
|                      | Percentage of tonnage shipped which went by own vehicle |       |       |         |         |       |
|                      | 1-25  | 25-49 | 49-99 | 100-499 | 500-999 | Total |
| Foodstuffs           | —   | —     | 1     | 2       | 3       | 5     |
| Chemicals            | 1   | 3     | —     | 3       | 1       | 5     |
| Iron & steel         | —   | 1     | —     | 2       | 2       | 3     |
| Electronic equipment | —   | 1     | 1     | 2       | 1       | 5     |
| Paper                | 1   | —     | 2     | 3       | 9       | 15    |
| Total                | 2   | 4     | 4     | 12      | 17      | 39    |

Source: Commodity Survey.

Note: 60 transport on own account operators in the Commodity Survey stated that they did not have sufficient capacity to meet upward fluctuations in demand and used public carriers during these periods. Of these, 19 gave information on tonnages.

<sup>1</sup> The corresponding proportions for the Commodity Survey were nine-tenths and nine-quarters.

<sup>2</sup> For evidence of this complaint see European Transport by Road, T. 50, 188, pp. 19 and 20.

<sup>3</sup> *op. cit.* pp. 21 and 24.



## Use of public carriers

### Road haulage

Only about one-fifth of the small and medium firms in the General Survey using outside road hauliers sent more than four-fifths of their total traffic by this mode, whilst nearly one-half of the former and nearly one-third of the latter sent one-fifth or less of their traffic by this means. Very few (less than one-tenth) of the large establishments using outside road hauliers sent more than 80 per cent of their traffic by this mode, but in contrast to the small and medium firms they were fairly evenly spread amongst the remaining percentage groupings (see Table below) with no peaking in the less than 21 per cent grouping.

**Table 62: Proportion of total tonnage sent by road hauliers, analysed by size of establishment**

| Size<br>(employees) | Number of establishments |       |       |       |        | Total |
|---------------------|--------------------------|-------|-------|-------|--------|-------|
|                     | Percentage               |       |       |       |        |       |
|                     | 1-20                     | 21-40 | 41-60 | 61-80 | 81-100 |       |
| Over 499            | 39                       | 9     | 4     | 16    | 3      | 36    |
| Per cent            | 38                       | 23    | 11    | 28    | 6      | 100   |
| 100-499             | 30                       | 18    | 8     | 19    | 23     | 97    |
| Per cent            | 31                       | 18    | 8     | 20    | 23     | 100   |
| Under 100           | 28                       | 7     | 5     | 8     | 13     | 61    |
| Per cent            | 46                       | 13    | 8     | 13    | 21     | 100   |
| Not known           | 3                        | 1     | —     | —     | —      | 3     |
| Total               | 70                       | 35    | 17    | 37    | 38     | 197   |
| Percent             | 35                       | 18    | 9     | 19    | 19     | 100   |

Source: General Survey.

Note: More than 197 establishments used outside road hauliers but not all give figures on tonnage shipped.

With the exception of Electronic equipment, where establishments using outside road hauliers make less frequent use of them than in the case in other industries, the frequency of use is very similar in all industries (see Table below).

**Table 63: Proportion of total tonnage sent by road hauliers in selected industries**

| Names of business    | Percentage |       |       |       |        | Total |
|----------------------|------------|-------|-------|-------|--------|-------|
|                      | 1-20       | 21-40 | 41-60 | 61-80 | 81-100 |       |
| Foodstuffs           | 13         | 9     | 2     | 1     | 9      | 34    |
| Per cent             | 38         | 26    | 6     | 3     | 27     | 100   |
| Chemicals            | 15         | 11    | 3     | 5     | 12     | 46    |
| Per cent             | 33         | 24    | 6     | 11    | 26     | 100   |
| Iron and steel       | 14         | 6     | 7     | 3     | 9      | 39    |
| Per cent             | 36         | 15    | 18    | 8     | 23     | 100   |
| Electronic equipment | 17         | 5     | 2     | 3     | 3      | 30    |
| Per cent             | 37         | 20    | 7     | 10    | 6      | 100   |
| Paper                | 35         | 8     | 7     | 13    | 23     | 77    |
| Per cent             | 32         | 10    | 9     | 20    | 29     | 100   |
| Total                | 84         | 40    | 21    | 27    | 54     | 226   |
| Per cent             | 37         | 18    | 9     | 12    | 24     | 100   |

Source: Commodity Survey.

Although only a minority of establishments rely solely upon road hauliers the vast majority (90 per cent in both Surveys) of those who considered road haulage to be their main form of transport always placed their traffic with the same operators. The situation is, therefore, very different from that investigated by Gilbert Walker in the 1930's when shippers rarely had regular carriers and where Dutch auctions on shippers' premises were not uncommon at the end of the day.<sup>1</sup>

### Customer collection

Customer collection is surprisingly common with about one-third of all firms using customer collection to some degree. But although a few establishments rely almost entirely upon customer collection (about 2 per cent sent over 80 per cent of their traffic by this means), nine-tenths of establishments send less than one-fifth of their total traffic by customer collection. Customer collection is most frequent amongst large firms and in the Chemical industry, but there is not a great deal of difference between the size and commodity groups.

### GPO

GPO, like customer collection, is used by about one-third of establishments, and as with customer collection nine-tenths of the establishments send less than one-fifth of their traffic (measured in tons) by this means while only 2 per cent send over 80 per cent. It is most common in the Electronic equipment industry where nearly half of the establishments make use of the GPO parcels service but none for more than one-fifth of their traffic.

### Rail

Although the number of establishments using the railway was about four-fifths of the number using road hauliers in the Commodity Survey, and about three-quarters in the General Survey the frequency of use was much less than was the case with road haulage. Nearly four-fifths of the firms using rail sent less than one-fifth of their traffic by this mode while the corresponding figure for firms using road haulage was only just over one-third (see Table below).

**Table 64: Proportion of total tonnage sent by rail, analysed by size of establishment**

|                     | Number of establishments |       |       |       |        |       |
|---------------------|--------------------------|-------|-------|-------|--------|-------|
| Size<br>(employees) | Percentage               |       |       |       |        | Total |
|                     | 1-20                     | 21-40 | 41-60 | 61-80 | 81-100 |       |
| Over 499            | 15                       | —     | 1     | 2     | 1      | 13    |
| Per cent            | 83                       | —     | 6     | 9     | 4      | 100   |
| 100-499             | 61                       | 8     | 4     | 1     | —      | 76    |
| Per cent            | 83                       | 11    | 5     | 1     | —      | 100   |
| Under 100           | 29                       | 7     | 2     | —     | 4      | 42    |
| Per cent            | 69                       | 17    | 5     | —     | 9      | 100   |
| Not known           | —                        | —     | 1     | —     | —      | 1     |
| Total               | 111                      | 15    | 8     | 3     | 5      | 142   |
| Per cent            | 78                       | 11    | 6     | 2     | 3      | 100   |

Source: General Survey.

<sup>1</sup> See Road and Rail by Gilbert Walker p. 104.

Even the important users of rail like the Chemical and Iron and Steel industries made relatively infrequent use of it with nearly nine-tenths of establishments in the case of the former and about three-quarters in the case of the latter sending less than one-fifth of their traffic by this mode (see Table below).

**Table 65: Proportion of total traffic sent by rail in selected industries**

|                      |            | Number of establishments |       |       |        |       |
|----------------------|------------|--------------------------|-------|-------|--------|-------|
| Nature of business   | Percentage |                          |       |       |        |       |
|                      | 1-20       | 21-40                    | 41-60 | 61-80 | 81-100 | Total |
| Foodstuffs           | 22         | 1                        | 1     | —     | 1      | 25    |
| Per cent             | 88         | 4                        | 4     | —     | 4      | 100   |
| Chemicals            | 32         | 3                        | 1     | 1     | —      | 37    |
| Per cent             | 86         | 6                        | 3     | 3     | —      | 100   |
| Iron and steel       | 28         | 1                        | 2     | 3     | —      | 34    |
| Per cent             | 78         | 4                        | 7     | 11    | —      | 100   |
| Electronic equipment | 36         | 4                        | 2     | —     | —      | 42    |
| Per cent             | 81         | 13                       | 6     | —     | —      | 100   |
| Paper                | 50         | 4                        | 2     | —     | 1      | 57    |
| Per cent             | 88         | 7                        | 3     | —     | 2      | 100   |
| Total                | 151        | 13                       | 8     | 4     | 2      | 178   |
| Percent              | 85         | 7                        | 5     | 2     | 1      | 100   |

Source: Commodity Survey.

The infrequent use of rail by establishments in the Chemical and Iron and Steel industries is very surprising in view of the fact that these two industries in the Commodity Survey sent one-third of their traffic, in terms of tonnage, by rail (see Chapter 2, Part III), the reason for this lies in the fact that a small number of firms in the Chemical and Iron and Steel industries send enormous tonnages by rail and this radically affects the proportion of total traffic in these two industries going by that mode.

#### Past and planned changes in mode of transport used

Approximately one-tenth of the establishments in the two Surveys had had a major change<sup>1</sup> in the mode of transport used during the two year period before the Survey is September 1964–September 1966, and one-twentieth of establishments in the two Surveys had already planned major changes but had not at the time of the Survey put them into operation<sup>2</sup>. Within a comparatively short space of time, therefore, a substantial number of establishments had already effected or intended an important change in the mode of transport they used. So not only do firms have, as previously noted, a considerable diversity in the modes they currently use, but there is also a constant changing between modes. As was the case with the diversity of modes used the larger establishments tend to introduce changes with greater frequency than small ones, but, nevertheless, a substantial number of small firms carried out major changes during the two year period. There is an awareness, therefore, on the part of shippers of the types of service offered by the different modes of transport.

<sup>1</sup> Defined as a switch of 5 per cent or more of total tonnage shipped from one mode to another.

<sup>2</sup> 5 establishments in the Commodity Survey and 1 in the General Survey had already had major changes and also planned major changes.

In both Surveys there was no particular type of past change that was excluded (see Tables below), but the moves from rail were, however, much more significant than any of the others. The proportions for both surveys are almost identical with about 60 per cent of establishments which had a major change moving away from rail, and of these, two-thirds went over to professional road hauliers, and one-third changed to their own fleets. The next most important changes that occurred were between own fleets and road hauliers and vice versa, this accounted for about one-fifth of the establishments that made a change in both surveys, but whereas in the Commodity Survey the moves exactly cancelled themselves out, the movement to road hauliers from own fleet in the General Survey was three times as great as in the other direction.

The similarity of the changes in the two Surveys would lead one to assume that the commodity bias in the Commodity Survey was not having any influence. There was, however, a concentration in both Surveys in particular industries. In the Commodity Survey 11 of the 29 changes from rail were made by establishments in the Paper Industry and in the General Survey 11 of the 14 establishments that moved from rail to road hauliers were in the Clothing and Footwear industries. Some concentration is to be expected in both these groups as the Paper industry comprises nearly one-third of the establishments in the Commodity Survey and Clothing and Footwear a similar proportion of the establishments in the General Survey. Nevertheless the number of firms that changed in these industries is significantly greater than would be expected from the importance of these industries in the two Surveys.

Although there has been a net movement from rail to road, the main movement has been in those industries which provide an insignificant part of rail traffic, but it should also be noted that in the Commodity Survey there was a net move of 5 establishments from rail to road haulier in the two important industry groups for rail namely Chemicals and Iron and Steel.

The planned changes are in complete contrast to those that have already taken place (see Tables below). In the General

**Table 66: Nature of Past Changes analysed by size of establishment**

| Mode of transport                 | Number of establishments |         |           |       |
|-----------------------------------|--------------------------|---------|-----------|-------|
|                                   | Size (employees)         |         |           | Total |
|                                   | Over 499                 | 100-499 | Under 100 |       |
| Own road vehicle to road haulier  | 1                        | 3       | 2         | 6     |
| Own road vehicle to rail          | —                        | 1       | —         | 1     |
| Own road vehicle to other         | —                        | 1       | —         | 1     |
| Road haulier to own road vehicles | —                        | 2       | —         | 2     |
| Road haulier to rail              | —                        | —       | 2         | 2     |
| Road haulier to other             | —                        | —       | 1         | 1     |
| Rail to own road vehicle          | 1                        | 3       | 3         | 7     |
| Rail to road haulier              | 2                        | 9       | 3         | 14    |
| Rail to other                     | —                        | 1       | —         | 1     |
| Other to rail                     | —                        | —       | —         | —     |
| Other to own road vehicle         | —                        | —       | —         | —     |
| Other to road haulier             | —                        | 1       | —         | 1     |
| Total                             | 4                        | 21      | 11        | 36    |

Source: General Survey.

Survey 4 of the 11 establishments planning major changes are moving over to rail whilst no establishment is moving in the opposite direction and in the Commodity Survey 9 of the 19 establishments planning changes are moving to rail whilst only 3 are planning moves in the opposite direction. These movements to rail are interesting for they feature an industry that because of the high risk of damage has always relied heavily upon transport on own account. Of the 5 establishments in the Commodity Survey moving from own transport to rail 3 were in the Electronic equipment industry, and of the 4 establishments moving from road hauliers to rail 1 was in Electronics.<sup>1</sup>

Although there are comparatively few observations to draw conclusions from, it nevertheless appears that there has recently been an important change in the attitude of shippers towards the railway.

Table 67: Nature of Planned Changes analysed by size of establishment

| Mode of transport                | Number of establishments |         |           |       |
|----------------------------------|--------------------------|---------|-----------|-------|
|                                  | Size (employees)         |         |           |       |
|                                  | Over 499                 | 100-499 | Under 100 | Total |
| Own road vehicle to road haulier | —                        | —       | 1         | 1     |
| Own road vehicle to rail         | 2                        | —       | —         | 2     |
| Own road vehicle to other        | —                        | —       | —         | —     |
| Road haulier to own road vehicle | 1                        | 1       | 2         | 4     |
| Road haulier to rail             | 2                        | —       | —         | 2     |
| Road haulier to other            | —                        | 1       | —         | 1     |
| Rail to own road vehicle         | —                        | —       | —         | —     |
| Rail to road haulier             | —                        | —       | —         | —     |
| Rail to other                    | —                        | —       | —         | —     |
| Other to rail                    | —                        | —       | —         | —     |
| Other to own road vehicle        | —                        | —       | —         | —     |
| Other to road haulier            | —                        | —       | —         | —     |
| Total                            | 6                        | 2       | 3         | 11    |

Source: General Survey.

Table 68: Nature of Past Changes in selected industries

| Mode of transport                | Number of establishments |           |                |                      |       |       |
|----------------------------------|--------------------------|-----------|----------------|----------------------|-------|-------|
|                                  | Food-stuffs              | Chemicals | Iron and steel | Electronic equipment | Paper | Total |
| Own road vehicle to road haulier | 3                        | 1         | —              | —                    | 1     | 5     |
| Own road vehicle to rail         | —                        | 1         | —              | 1                    | 1     | 3     |
| Own road vehicle to other        | —                        | —         | —              | 1                    | —     | 1     |
| Road haulier to own road vehicle | 1                        | 1         | —              | 2                    | 1     | 5     |
| Road haulier to rail             | 1                        | 2         | 1              | —                    | —     | 4     |
| Road haulier to other            | —                        | —         | —              | —                    | —     | —     |
| Rail to own road vehicle         | 1                        | 2         | —              | 4                    | 3     | 10    |
| Rail to road haulier             | 2                        | 3         | 3              | 1                    | 2     | 19    |
| Rail to other                    | —                        | —         | —              | —                    | —     | —     |
| Other to rail                    | —                        | —         | —              | —                    | —     | —     |
| Other to own road vehicle        | —                        | —         | —              | —                    | —     | —     |
| Other to road haulier            | —                        | —         | —              | —                    | —     | —     |
| Total                            | 8                        | 12        | 4              | 9                    | 14    | 47    |

Source: Commodity Survey.

Table 69: Nature of Planned Changes in selected industries

| Mode of transport                | Number of establishments |           |                |                      |       |       |
|----------------------------------|--------------------------|-----------|----------------|----------------------|-------|-------|
|                                  | Food-stuffs              | Chemicals | Iron and steel | Electronic equipment | Paper | Total |
| Own road vehicle to road haulier | —                        | 2         | 1              | —                    | —     | 3     |
| Own road vehicle to rail         | —                        | —         | 1              | 3                    | 1     | 5     |
| Own road vehicle to other        | —                        | —         | —              | —                    | 1     | 1     |
| Road haulier to own road vehicle | —                        | —         | 1              | 1                    | 1     | 3     |
| Road haulier to rail             | —                        | —         | 1              | 1                    | 2     | 4     |
| Road haulier to other            | —                        | —         | —              | —                    | —     | —     |
| Rail to own road vehicle         | 1                        | —         | —              | —                    | —     | 1     |
| Rail to road haulier             | —                        | —         | —              | 1                    | 1     | 2     |
| Rail to other                    | —                        | —         | —              | —                    | —     | —     |
| Other to rail                    | —                        | —         | —              | —                    | —     | —     |
| Other to own road vehicle        | —                        | —         | —              | —                    | —     | —     |
| Other to road haulier            | —                        | —         | —              | —                    | —     | —     |
| Total                            | 1                        | 2         | 4              | 6                    | 6     | 19    |

Source: Commodity Survey.

<sup>1</sup> Of the remaining 3, 2 were in the Paper industry which shows a reversal of the trend that existed prior to the Survey.

## Reasons for change

The most important reason for past changes from rail in the General Survey was slowness and delays, and this was followed by losses and damage, with increased rail charges only third (see Table below).

**Table 70: Reasons for Past Changes from Rail in selected industries**

| Reason              | Number of mentions | Percentage of mentions |
|---------------------|--------------------|------------------------|
| Slowness and delays | 12                 | 36                     |
| Losses and damage   | 9                  | 27                     |
| Increased charges   | 7                  | 21                     |
| Rail closures       | 3                  | 9                      |
| Other               | 2                  | 7                      |
| <b>Total</b>        | <b>33</b>          | <b>100</b>             |

Source: General Survey.

Notes:

Losses and damage includes 2 establishments which could not obtain insurance cover because of high number of claims made in the case of rail shipments.

Some of the 22 establishments gave more than one reason hence number of mentions not of establishments.

In the Commodity Survey, slowness and delays was again the most important reason for changing from rail (see Table below), but in the two industries where there was a large number of observations, Paper and Chemicals, the ordering differed. Nearly one-half of the mentions in Chemicals was increased charges whilst a similar proportion in the Paper industry was slowness and delays.

**Table 71: Reasons for Past Changes from Rail in selected industries**

| Reason              | All industries  |               | Chemicals       |               | Paper           |               |
|---------------------|-----------------|---------------|-----------------|---------------|-----------------|---------------|
|                     | No. of mentions | % of mentions | No. of mentions | % of mentions | No. of mentions | % of mentions |
| Slowness and delays | 11              | 38            | 2               | 22            | 6               | 46            |
| Losses and damage   | 6               | 20            | 1               | 12            | 4               | 31            |
| Increased charges   | 8               | 26            | 4               | 44            | 3               | 23            |
| Rail closures       | 3               | 10            | 1               | 11            | —               | —             |
| Other               | 1               | 4             | —               | —             | —               | —             |
| <b>Total</b>        | <b>29</b>       | <b>100</b>    | <b>9</b>        | <b>100</b>    | <b>13</b>       | <b>100</b>    |

Source: Commodity Survey.

Over one-half of the establishments which planned changes to rail in the General Survey had done so on account of Freight Liners, and a similar proportion of establishments in the Commodity Survey was doing so for the same reason. Of the establishments in the Commodity Survey planning to use the Freight Liner service nearly one-half was in the Paper industry and one-quarter in the Iron and Steel industry.

If necessary, therefore, it has been shown in this chapter that a manufacturer uses a variety of modes of transport and does not concentrate his traffic to a very marked extent on his main mode. (The use of a number of modes is rather more prevalent in the large and medium sized establishments than amongst small establishments however). Moreover, ownership of transport facilities such as a 'C' licensed fleet or rail siding does not lead to a marked difference in use of various modes—although the presence of a group policy with respect to transport does tend, as expected, to reduce flexibility in choice of modes. Some manufacturers with their own fleets have insufficient capacity to meet fluctuations in demand and use professional carriers at such times, but the majority of such operators also use professional carriers during off-peak periods; thus there is little evidence to support the argument that professional operators are used by 'C' licence fleet owners only as fulfilling a stand-by role. Finally, the relative frequency with which switches between modes of transport occur point to an awareness amongst many manufacturers of the transport services that are available. All relevant indicators therefore point to ownership of facilities not being a significant influence on the distribution of traffic between modes.

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## Part III

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### Other survey findings

## General characteristics of consignments generated

Since an integral part of the present survey was the use of data on consignments as the method of determining the detailed use of transport in different industries, a by-product of this approach is the information which is yielded on the characteristics of consignments generated by British manufacturing industry.

The technique of the consignment sample has been mentioned in the Introduction but it would be useful to record here that it related to outward movements (only) from establishments and that all types of movement were covered except those between two establishments of the same firm which are situated in close proximity to one another. This ruling would exclude movements between two sections of a large steel plant for example, or movements between a manufacturing plant and its warehouse (unless the latter was some miles distant).

The information gathered in respect of each consignment was quite detailed; reference to the copy of the questionnaire reproduced in Appendix 1 will show the full range of questions asked. Basically, however, the questions fall into four groups:

- those that establish the main characteristics of the consignment—weight, commodity, distance carried, etc,
- those that provide information on the mode of transport used and cost of consigning,
- those that show any special features relating to the consignment,
- those that cover its history in transit, for example, the time taken for the journey and whether the consignment was damaged or not.

Most of the questions are self-explanatory and need not be discussed further. Those relating to history in transit however, since the answers could only be provided by the consignee, necessitated the use of a specially designed card for recording the information required. The card was despatched by the consignor with the consignment and/or with other documents relating to the consignment, completed by the consignee, and returned to the survey control point. The card then had to be matched up with the main consignment form in order to determine and record time taken.

Information on lost consignments was supplied by the consignor at the re-call interview. This interview normally occurred some seven to fourteen days after the end of the period to which the consignment data related so that, taking the mean length of time for the re-call interview as ten days, anything that had not arrived at its inland destination within, on average, ten days and had been expected to arrive earlier, was reported lost. It is probable that some of the consignments recorded as being lost for the purpose of the present survey, were tracked down at a later period.

The journey length was not recorded by the establishment but calculated from the information received on the geographical location of the consignor and the consignment's destination. For this calculation the relevant mileage used was the road dis-

tance between the two points. If rail distance had been used, it is estimated that the mileages would have been about 10 per cent lower.

Finally, it should be noted that the results of the sample of consignments were not intended to provide information on the total demand for transport or total number of consignments generated by all manufacturing industry. Although the number of consignments obtained for the industries included in the Commodity Survey probably amounted to some five per cent of all the consignments made by the industries during an average week, the percentage was very much smaller in the case of the General Survey, so that any attempt to measure the total movements of consignments, in the latter survey in particular, would have involved unacceptably large sampling errors.\*

Grossing factors were therefore not applied to the sample of establishments included in the survey, grossing factors were however applied to the sample of consignments obtained from each establishment. This was necessary, not because of a need to provide a measure of total demand but in order to include consignments from each establishment in their correct proportion—the percentage of consignments sampled varied from establishment to establishment.

### Number of consignments

The number of consignments for which data was recorded totalled about 16,600 for the Commodity Survey, 13,600 for the General Survey and, after grossing up, the figures were 141,900 and 64,400 respectively. The latter were distributed over the whole range of manufacturing industry and involved a wide range of commodities; the only commodities not adequately represented were raw foodstuffs, fuel, building materials such as sand, stone, etc, and some crude materials such as ores—these commodities rarely form outwards consignments from manufacturing establishments. The consignments covered by the Commodity Survey consisted of 22,600 for the foodstuffs industry studied, 38,300 for the general chemicals industry, 31,600 for the iron and steel industry, 15,900 for the radio and electronics industry and 33,200 for the paper and paper goods industry. The commodities involved consisted mainly of products associated with each of these industries.

The total number of establishments covered by the General Survey was 361 so that the average number of consignments despatched per establishment per week was about 180. This number showed considerable variation according to type of industry, however, with establishments in the foodstuffs and

\*A measurement of total demand is quite unnecessary for the purpose of the present inquiry, which is, essentially, to throw light on the allocation of demand between different means of transport rather than the total demand for each means.

chemicals groups, for example, despatching two to three times as many consignments as those in the finished manufactured goods group. To a certain extent it also reflects differences in average size of establishment in the various industries. The influence of size is obviously important as large establishments of 500 or more employees in most industries despatch about twice as many

consignments as medium sized establishments and about four times as many as small establishments. Indeed, variance analysis shows that size is twice as important as the type of product involved in its influence on the number of consignments an establishment can be expected to generate.

Taking each industry covered by the General Survey, the following characteristics are worth noting. In the production of foodstuffs, although size of establishment in this industry is at about the average level for manufacturing industry as a whole, the number of consignments generated is well above average; this is probably because the industry produces mainly for final consumption. In chemical production also, partly because of above average sized production units and partly because of other reasons the number of consignments made each week is well above average. The figures for iron and steel shown by the General Survey probably underestimate the average number of consignments despatched per establishment and if the results of the Commodity Survey are used, this industry is seen to consign about the number expected from its ranking in the list of average size of establishments. The engineering and electrical goods industries tend to be below average in number of consignments despatched, given the average size of establishment in this industry. Similarly in the production of vehicles and transport equipment, although the industry ranks first in average size of establishment it ranks sixth in number of consignments generated. Textiles, clothing and footwear rank last in number of consignments generated per establishment but this is to be expected given the below average size of establishment in this industry.

Table 72: Number of consignments represented by the consignment sample

| General Survey                   |                   | Commodity Survey         |                   |
|----------------------------------|-------------------|--------------------------|-------------------|
| Commodity                        | Consign-<br>ments | Industry                 | Consign-<br>ments |
| Foodstuffs                       | 16,420            | Food (MLH 214,215)       | 22,580            |
| Crude materials                  | 3,050             | Chemicals (MLH 271)      | 36,300            |
| Chemicals                        | 4,060             | Iron and Steel (MLH 311) | 31,600            |
| Building materials               | 3,660             |                          |                   |
| Iron and steel products          | 1,720             | Electronics (MLH 344)    | 15,450            |
| Non ferrous metals               | 930               | Paper (MLH 481-3)        | 33,240            |
| Engineering and electrical goods | 3,030             |                          |                   |
| Transport equipment              | 2,630             |                          |                   |
| Metal manufactures               | 2,970             |                          |                   |
| Other manufactured goods         | 36,330            |                          |                   |
| Other commodities                | 280*              |                          |                   |
| Total                            | 64,380*           | Total                    | 341,570           |

\*Includes consignments where commodity is not stated.

Table 73: Average number of consignments despatched per establishment per week

| Industry                                  | Size (employees) |         |        |           |
|---|------------------|---------|--------|-----------|
|   | Over 499         | 100-499 | 11-99  | All sizes |
| S.E.C.                                    |                  |         |        |           |
| III Food, drink and tobacco               |                  |         |        |           |
| IV Chemicals and allied                   | 330              | 420     | 180    | 460       |
| V Metal manufactures*                     | 1,350            | 220     | 30     | 430       |
| VI Engineering and electrical goods       | 300              | 80      | 20     | 80        |
| VIII Vehicles                             | 240              | 90      | 30     | 120       |
| VII & IX Shipbuilding, metal goods & s.s. | 240              | 90      | 40     | 140       |
| X-XII Textiles and clothing               | 360              | 100     | 120    | 260       |
| XIII Bricks, cement, etc.                 | 170              | 140     | 80     | 130       |
| XIV-XVI Other manufacturing               | 300              | 160     | (200)† | 230       |
|   | 230              | 100     | 100    | 200       |
| All manufacturing industry                | 340              | 170     | 90     | 180       |

Source: General Survey

\*Commodity Service shows higher figures per establishment for general iron and steel manufacturing (MLH 311) and because of sampling error (the sample was drawn) the lower survey probably gives a more representative picture for the iron and steel industry, i.e. 750, 250 and 80 consignments respectively per establishment.

†Including one establishment with an abnormally large number of consignments for its size, this figure would be 40.

Table 74: Number of consignments per establishment compared with average size of establishment

| Industry                                  | Average no. of employees per establishment | Ranking | Ranking in no. of consignments generated* |
|---|--|---------|---|
| S.E.C.                                    |  |         |   |
| III Food, drink and tobacco               | 70   | 5       | 2   |
| IV Chemicals and allied                   | 125  | 3       | 1   |
| V Metal manufactures                      | 197  | 2       | —   |
| VI Engineering and electrical goods       | 115  | 4       | 7   |
| VIII Vehicles                             | 241  | 1       | 6   |
| VII & IX Shipbuilding, metal goods & s.s. | 69   | 7       | 3   |
| X-XII Textiles and clothing               | 72   | 6       | 7   |
| XIII Bricks, cement, etc.                 | 58   | 8       | 4   |
| XIV-XVI Other manufacturing               | 46   | 9       | 3   |
| All manufacturing industry                | 83   | —       | —   |

†Source: 1958 Census of Production

\*Source: General Survey

#### Tonnage consigned

Since the consignment is the primary means by which transport use is studied in detail in the present survey, the information that emerges is mainly in terms of numbers of consignments. These are analysed by weight so that a distribution by weight classes is available but, in addition, it would be useful to give some indication of what this means in terms of the total ton-

nage involved. In order to do this, some approximation is needed since the tonnage consigned is readily calculable only by multiplying the number of consignments in each weight class by the mid-point of the class. This assumes that the distribution of consignments within each class is normal (i.e. symmetrical), which is probably a workable assumption, while the topmost class of ten tons and over, being open-ended, has to be allocated an arbitrary average value of 15 tons.

The results of this calculation show that the establishments covered by the General Survey together despatched a total of about 80,000 tons during an average week in 1966 while the ones included in the Commodity Survey consigned about 425,000 tons. If these figures are multiplied by 48, which is the factor normally used in transport surveys to gross up from a week's sample to an annual total, the product is 3.8 million and 20.5 million tons, respectively.

For the purpose of checking the representativeness of the consignment sample, the two latter figures can be compared with the sum of the annual tonnage despatched, which was recorded by each establishment on the first part of its questionnaire, and which totalled 4.1 million in the General Survey and 25.3 million in the Commodity Survey. The difference between the two estimates is very small in the case of the former survey but it amounts to 25 per cent in the latter. A detailed comparison for each industry included in the Commodity Survey shows however that the discrepancy arises mainly in the chemical industry and that probably the main reason for it is the inapplicability of the assumption that the average value of the weight class 'ten tons and over' is 15 tons; in the chemical industry some consignments can be very large and a mean value of 20 or even 30 tons for this class would not be unrealistic in this industry. Thus, if a mean value of 20 tons were adopted for the chemical industry the difference between the estimates of annual tonnage yielded by the consignment sample and that recorded by the industries included in the Commodity Survey would narrow to 15 per cent, while if 30 tons was used the difference would be less than 5 per cent.

#### Distribution of consignments by size

Perhaps one of the most revealing general results of the present survey relates to the most frequent size of consignment generated by British manufacturing industry. The average is  $1\frac{1}{2}$  tons but this is of course a mid point of a wide range and the distribution of consignments between the various weight groups presents more meaningful information. This reveals that 50 per cent of all consignments made weighed less than 113 lbs, a further 50 per cent weighed between 113 and 2240 lbs, only about 20 per cent weighed more than a ton (2240 lbs) of which a fifth (4 per cent of all consignments) were over ten tons.\*

Considerable variation occurs according to the commodity involved and whereas a relatively high proportion of consignments of foodstuffs, iron and steel, building materials and chemicals were at the heavier end of the range (30-50 per cent over a ton), the proportion was very much less in the case of finished manufactured goods such as engineering and electrical products, metal goods, textiles, etc. Indeed, there is a fairly

clear distinction in size of consignments between those industries that produce intermediate goods, i.e. products that form inputs of other industries, and those that produce for final demand. Amongst the latter industries size of consignments tends to be very small—over a third were less than 23 lbs and about two-thirds weighed less than 113 lbs—while amongst the former, consignments of all sizes up to 10 tons and more are not infrequent. Moreover, if it were possible to segregate those industries that produce purely for intermediate demand, for example as has been done in the Commodity Survey with the 'heavy' branch of the iron and steel industry (SALT 311), it is probable that a much more distinct concentration of consignments in the heavier weight groups in these industries would become apparent: it must be remembered that the categories of industries shown in Table 75 are fairly broad and the chemicals industry in particular covers a number of activities which produce for final demand, e.g. pharmaceutical and toilet preparations.

A more general and pertinent question that might be asked is why is it that apart from those industries producing for intermediate demand, manufacturing establishments consign in such small quantities? It is beyond the scope of the present survey to answer this question since it concerns not only attitudes towards stock-holding, capabilities for bulk consignments, etc., but also such fundamental issues as size of establishment, duration of production runs, and so on. It may even be inevitable that as an economy becomes more technologically advanced, the products of its industries become lighter in weight but, relative to their size, very high in value, for example, the electronics industry studied in the Commodity Survey despatched more than half its consignments in packages of less than 23 lbs.

Comparison with the situation in American industry indicates that British industry is not abnormal in this respect. Although the average size of consignment in most industries, and in manufacturing industry taken as a whole, is much larger in the USA than in Britain (probably because of differences in average size of plant) the difference in size of consignment of finished manufactures compared with intermediate products is the same in both countries. In other words, taking the average for all industry in each country as 1.0, the relative size of consignment in engineering and electrical goods production is 0.26 and 0.33 in Great Britain and USA respectively, and in 'other' manufacturing 0.30 and 0.30, respectively.

\*In tonnage terms, the proportions are actually very different with consignments weighing less than 113 lbs accounting for only 1 per cent of total tonnage, those weighing from 113 to 2240 lbs 6 per cent, those weighing from 1 to 10 tons 51 per cent, while the relatively infrequent large consignments of over 10 tons accounted for 42 per cent of total tonnage despatched by manufacturing industry.



Table 75: Distribution of consignments by size (weight)

For each of total number of consignments of each commodity

| Commodity  | Weight group     |        |                   |                    |                  |                 |                   | Total |
|--|------------------|--------|-------------------|--------------------|------------------|-----------------|-------------------|-------|
|  | Over<br>Not over | 22 lbs | 22 lbs<br>112 lbs | 112 lbs<br>560 lbs | 560 lbs<br>1 ton | 1 ton<br>5 tons | 5 tons<br>10 tons |       |
| Processed foods<br>of which, beans, meat<br>and vegetable products | 31               | 23     | 18                | 12                 | 9                | 3               | 3                 | 100   |
| Crude materials  | 11               | 33     | 16                | 14                 | 10               | 10              | 6                 | 100   |
| Chemicals  | 40               | 8      | 11                | 8                  | 8                | 8               | 17                | 100   |
| of which, 'heavy' chemicals  | 19               | 15     | 18                | 20                 | 13               | 11              | 14                | 100   |
| Building materials   | 4                | 18     | 19                | 14                 | 13               | 24              | 8                 | 100   |
| Iron and steel   | 23               | 15     | 14                | 14                 | 18               | 7               | 9                 | 100   |
| of which, steel  | 2                | 3      | 3                 | 9                  | 25               | 23              | 38                | 100   |
| Non ferrous metals   | 34               | 27     | 20                | 9                  | 9                | 1               | —                 | 100   |
| Engineering and electrical   | 49               | 18     | 22                | 7                  | 3                | 1               | —                 | 100   |
| of which, electronics  | 31               | 18     | 14                | 7                  | 7                | 3               | 1                 | 100   |
| Transport equipment  | 34               | 28     | 12                | 13                 | 4                | —               | —                 | 100   |
| Metal manufactures   | 42               | 12     | 24                | 13                 | 7                | 3               | 1                 | 100   |
| Other manufactures   | 36               | 33     | 18                | 5                  | 1                | —               | —                 | 100   |
| of which, paper  | 28               | 25     | 30                | 10                 | 10               | 4               | 3                 | 100   |
| All commodities  | 28               | 23     | 16                | 13                 | 11               | 5               | 4                 | 100   |

Source: General and Commodity Surveys. The all commodities figure is derived from the General Survey.

<sup>a</sup> Because of a number of small consignments for which precise weight not indicated, it has not been possible to allocate these between weight groups up to 560 lbs.

Table 76: Inter-industry comparison of average size of consignment, Great Britain and USA

| Industry                                       | Relative size of<br>consignment (all<br>manufacturing industry<br>= 1.0) |                     |
|--|--|---------------------|
|  | Great<br>Britain <sup>a</sup>  | U.S.A. <sup>†</sup> |
| S.I.C.   |  |                     |
| III Food, drink and tobacco                    | 1.2  | 1.0                 |
| IV Chemicals and allied                        | 3.4  | 1.5                 |
| V Metal manufacture                            | 3.0  | 3.4                 |
| VI Engineering and electrical goods            | 0.26   | 0.39                |
| VII & VIII Vehicles and transport<br>equipment | 2.0  | 1.4                 |
| XIII Bricks, cement, etc.                      | 1.0  | 5.2                 |
| IX-XII   |  |                     |
| XIV, XVI Other manufacturing                   | 0.30   | 0.30                |
| All manufacturing industries                   | 1.0  | 1.0                 |

<sup>a</sup>Source: General Survey<sup>†</sup>Source: 1963 Census of Transportation, basic figures are estimates based on the distribution shown in "Commodity Transportation Survey, Shipper Groups" Table 3.

Table 76a: Average size of consignment in selected industries, Great Britain compared with USA

| Industry                               | Average size (lb)             |                     |
|--|-------------------------------|---------------------|
|  | Great<br>Britain <sup>a</sup> | U.S.A. <sup>†</sup> |
| Foodstuffs (MLH 214, 215) <sup>a</sup> | 1,500                         | 3,100               |
| Chemicals (MLH 277) <sup>a</sup>       | 12,500                        | 20,000              |
| Iron and steel (MLH 311) <sup>a</sup>  | 16,500                        | 25,000              |
| Electronics (MLH 354) <sup>a</sup>     | 850                           | 1,000               |
| Paper (MLH 481-3)                      | 2,700                         | 5,600               |

<sup>a</sup>Source: Commodity Survey<sup>†</sup>Source: 1963 Census of Transportation (see footnote to Table 5b)

Notes

<sup>1</sup> Great Britain group includes meat, fish, fruit and vegetable processing whereas nearest equivalent U.S. group includes meat and dairy products processing.<sup>2</sup> Great Britain group includes dyestuffs, fertilisers and 'other' chemicals; U.S. group also includes plastic materials.<sup>3</sup> Great Britain group includes wrought iron and steel; U.S. group also includes iron castings.<sup>4</sup> U.S. group also includes telephones and telegraph apparatus.

# Distribution of consignments by length of haul

A second characteristic of consignments is the distance over which they are despatched. Distance is obviously a function of a country's geography and of its industrial location pattern, so that the findings of the present analysis will reflect the existing situation in Great Britain. They would probably be vastly different for another country, eg the U.S.A., and even different in Britain if a major shift occurred away from traditional locations for industry—as the result of regional policies for example.

Given the present industrial concentrations, it is not surprising that over a third of consignments made by manufacturing industry were over distances of not more than 25 miles and a half were moved less than 50 miles. Short hauls were particularly common in the food processing and building materials industries, many of which presumably, serve local and not national markets. Medium hauls of 75 to 150 miles were not an important feature of any industry except iron and steel manufacture where a relatively high proportion of movements occurred in the 75-100 mile bracket, and engineering and electrical goods where a fifth of all consignments were over distances of 125-150 miles. Long hauls of over 150 miles were common in the chemicals, non-ferrous metals and metal manufacturing industries but very long hauls of 300 miles or more, a distance of from London to Scotland or the far South West, were not very numerous in any industry except metal manufactures.

Thus, the broad pattern of industrial production in Britain may be summarized as follows. Foodstuffs and building materials industries serve mainly local markets and, since the former produces mainly for final demand, most establishments in the foodstuffs industry would seem to be located near the main centres of population.\* The products of the iron and steel

industry move over all distances in fairly equal proportions suggesting a fairly wide scatter of the industries using these intermediate goods and also, of course, a fair geographical dispersion of iron and steel plants. Although the products of the chemicals, engineering and electrical goods, and transport equipment industries move over short and long distances, indicating either a fair dispersion of these activities, or of their customers, or both, only non-ferrous metals and manufactured metal goods were consigned mainly over long distances so that only in the latter industries can it be said that geographical dispersion, either of the industries or of their customers, is very marked. In fact it is the customers that are scattered since, as the results of the 1958 Census of Production shows, there is a very heavy concentration of the industries producing these goods in one part of the country—40 per cent of total employment in the non-ferrous metal and metal goods industries is in the Midland Region.†

## Regularity of consignments

Although information was collected in the present survey on the regularity with which a consignment was made, of all the consignment characteristics studied this is probably the most

\*This is borne out by the results of the 1958 Census of Production which shows nearly half the employment in the Food, Drink and Tobacco industry to be concentrated in the South East, Midlands and North West regions, which together account for 44 per cent of the population of Great Britain.

†As far as the sample of establishments for the General Survey was geographically biased, the conclusions reached about the non-ferrous and metal goods industries really apply to those branches of the industry outside the Midland Region. The same pattern may or may not be true of establishments in these industries in this latter region.

Table 77: Distribution of consignments by length of haul

| Commodity  | Haul             |          |                      |                       |                        |                        |           | Total |
|--|------------------|----------|----------------------|-----------------------|------------------------|------------------------|-----------|-------|
|  | Over<br>Net over | 25 miles | 25 miles<br>50 miles | 50 miles<br>100 miles | 100 miles<br>150 miles | 150 miles<br>200 miles | 200 miles |       |
| Processed foods<br>of which, bacon, meat and<br>vegetable products | 57               | 23       | 6                    | 4                     | 3                      | 5                      | 100       |       |
| Crude materials  | 45               | 19       | 12                   | 4                     | 3                      | 15                     | 100       |       |
| Chemicals<br>of which, 'heavy' chemicals                           | 25               | 7        | 24                   | 17                    | 13                     | 14                     | 100       |       |
| Building materials   | 6                | 20       | 22                   | 11                    | 20                     | 21                     | 100       |       |
| Iron and steel   | 11               | 19       | 14                   | 17                    | 17                     | 22                     | 100       |       |
| of which, steel  | 59               | 18       | 7                    | 4                     | 4                      | 8                      | 100       |       |
| Non-ferrous metals   | 17               | 11       | 25                   | 19                    | 13                     | 15                     | 100       |       |
| Engineering and electrical goods<br>of which, electronics          | 9                | 15       | 46                   | 13                    | 10                     | 7                      | 100       |       |
| Transport equipment  | 13               | 5        | 9                    | 19                    | 17                     | 37                     | 100       |       |
| Metal manufactures   | 8                | 23       | 18                   | 26                    | 6                      | 19                     | 100       |       |
| Other manufactures<br>of which, paper                              | 16               | 17       | 27                   | 19                    | 9                      | 12                     | 100       |       |
|  | 23               | 34       | 18                   | 16                    | 14                     | 15                     | 100       |       |
|  | 15               | 31       | 13                   | 13                    | 16                     | 32                     | 100       |       |
|  | 32               | 31       | 16                   | 15                    | 11                     | 15                     | 100       |       |
|  | 15               | 23       | 13                   | 11                    | 15                     | 21                     | 100       |       |
| All commodities  | 35               | 13       | 14                   | 13                    | 10                     | 13                     | 100       |       |

Source: General and Commodity Surveys. The all commodity figure is derived from the General Survey.

difficult to interpret. Frequent consignments to the same consignee can mean many things; it may be inherent in the nature of the commodity, *eg* foodstuffs, or it may merely reflect the distribution policy of the firm and its attitude towards stock-holding. It may even reflect horizontal integration of production processes.

However, the figures available from the General Survey show that about a quarter of all consignments made by manufacturing industry are made on a daily basis, a further quarter occur at least once a week while the remainder are mainly irregular. The influence of the type of commodity may be summarized as follows:

Movements occurring more than once a day are fairly common only in the iron and steel and transport equipment industries, suggesting above average inter-plant movements in these industries. The high proportion of daily consignments of foodstuffs is what one expects of an industry which despatches perishable commodities for final consumption. Weekly consignments are fairly important in all industries except engineering and electrical goods, which confirms previous evidence of a weekly cycle in transport activity in British industry. Fortnightly and monthly movements are not particularly important in any industry but irregular consignments, which means despatches that occur less frequently than once a month, are a significant feature of every industry except foodstuffs and particularly so in capital goods and consumer durables industries.

#### Delivery time

The time taken by consignments to reach their destination when handled by various modes of transport has already been discussed in Part II but it may be useful to examine the distribution of consignments by time taken without distinguishing between the modes used.

This analysis shows that a fairly high proportion (about a third) of the consignments made by British industry arrived at their destination on the same day as the despatch occurred while a further 20 per cent were delivered on the day following the day of despatch. Thus, about a half of all consignments made probably spent less than 24 hours in transit. This is true of almost all industries and is a particular feature of the foodstuffs and building materials industries where a very high proportion of consignments were same day deliveries.

Table 78: Distribution of consignments by regularity

| Commodity                        | Percentage           |       |        |             |         |           |
|----------------------------------|----------------------|-------|--------|-------------|---------|-----------|
|                                  | Regularity           |       |        |             |         |           |
|                                  | More than once a day | Daily | Weekly | Fortnightly | Monthly | Irregular |
| Processed foodstuffs             | 1                    | 52    | 35     | 5           | 4       | 2         |
| Crude materials                  | 1                    | 9     | 29     | 2           | 5       | 40        |
| Chemicals                        | 2                    | 2     | 32     | 9           | 9       | 48        |
| Building materials               | 2                    | 8     | 48     | 3           | 5       | 40        |
| Iron and steel manufactures      | 6                    | 6     | 32     | 8           | 8       | 30        |
| Non ferrous metals               | 1                    | 5     | 17     | 3           | 7       | 67        |
| Engineering and electrical goods | —                    | 1     | 4      | 4           | 4       | 87        |
| Transport equipment              | 8                    | 7     | 30     | 7           | 2       | 39        |
| Metal manufactures               | —                    | 12    | 25     | 5           | 12      | 46        |
| Other manufactures               | 1                    | 29    | 23     | 8           | 12      | 35        |
| All commodities                  | 1                    | 25    | 28     | 7           | 9       | 30        |

Source: General Survey

Transit times of 2 or 3 days are not uncommon in many industries but only in chemicals, metal manufactures and 'other' manufactured goods do they amount to about a third of the total movements. Longer delivery times are relatively infrequent in the foodstuffs, chemicals, building materials and non-ferrous metals industries, on the other hand they occur on about a third of consignments in the engineering and electrical goods, transport equipment, iron and steel manufacturing and metal goods industries.

Transit time is however partly, if not mainly, a reflection of the distance to market and it is not surprising that the foodstuffs and building materials industries should have such a high proportion of same day deliveries—as stated on page 74 they produce mainly for local markets. Nor are the longer transit times in the metal goods industry unexpected since it consigns over relatively long distances.

The data on time taken is therefore of limited value in itself. Although it may be informative to have the distributions, what is perhaps of greater relevance is the most frequent length of haul that is attained with same day deliveries, next day deliveries, and so on. Table 82 gives the relevant percentages for each

**Table 79: Distribution of consignments by regularity in selected industries**

| Regularity              | Industry                        |                        |                           |                          |                         |
|-------------------------|---------------------------------|------------------------|---------------------------|--------------------------|-------------------------|
|                         | Foodstuffs<br>(MLH 214,<br>218) | Chemicals<br>(MLH 271) | Iron & steel<br>(MLH 311) | Electronics<br>(MLH 364) | Paper<br>(MLH<br>401-3) |
| More than<br>once a day | 3                               | 4                      | 15                        | 3                        | 4                       |
| Daily                   | 46                              | 6                      | 39                        | 7                        | 17                      |
| Weekly                  | 37                              | 28                     | 32                        | 35                       | 28                      |
| Fortnightly             | 5                               | 12                     | 7                         | 7                        | 14                      |
| Monthly                 | 7                               | 16                     | 5                         | 5                        | 3                       |
| Irregular               | 4                               | 34                     | 31                        | 45                       | 50                      |
|                         | 100                             | 100                    | 100                       | 100                      | 100                     |

Source: Commodity Survey

**Table 80: Distribution of consignments by time taken**

| Commodity                        | Percentages |                     |        |        |        |        |        |              |
|----------------------------------|-------------|---------------------|--------|--------|--------|--------|--------|--------------|
|                                  | Time (days) |                     |        |        |        |        |        |              |
|                                  | Same day    | Not more than 1 day | 2 days | 3 days | 4 days | 5 days | 6 days | Formore days |
| Processed foodstuffs             | 52          | 26                  | 8      | 7      | 3      | 3      | —      | 1            |
| Crude materials                  | 30          | 15                  | 9      | 8      | 19     | 15     | 1      | 3            |
| Chemicals                        | 34          | 21                  | 19     | 12     | 5      | 1      | 3      | 5            |
| Building materials               | 58          | 14                  | 18     | 3      | —      | —      | 4      | 3            |
| Iron and steel manufactures      | 25          | 11                  | 8      | 9      | 7      | 4      | 5      | 21           |
| Non-ferrous metals               | 40          | 31                  | 14     | 3      | 9      | 3      | —      | —            |
| Engineering and electrical goods | 14          | 31                  | 9      | 10     | 7      | 5      | 13     | 13           |
| Transport equipment              | 21          | 23                  | 16     | 7      | 9      | 4      | 10     | 10           |
| Metal manufactures               | 20          | 12                  | 20     | 17     | 10     | 3      | 8      | 9            |
| Other manufactures               | 30          | 15                  | 20     | 10     | 8      | 10     | 4      | 3            |
| All commodities                  | 31          | 18                  | 17     | 10     | 8      | 7      | 4      | 5            |

Source: General Survey

journey length bracket. These show that same day deliveries are a feature of about half the movements of less than 50 miles, a third of the movements of between 50 and 100 miles, a quarter of the consignments travelling between 100 and 300 miles, but less than a tenth of those moving over that distance. Next day deliveries are mainly a feature of consignments in the 150 to 300 mile bracket. By the time 2 days have elapsed, over 80 per cent of the consignments travelling less than 50 miles have been delivered, two-thirds of the 50-100 mile movements, about 55 per cent of the 100-300 mile consignments, but only a third of those moving over 300 miles. After four days the distributions tail off rather rapidly for all distances up to 100 miles, rather less rapidly in the 100-300 mile bracket and least of all in the one over 300 miles. In every distance group, transit times greater than a week occur but the proportion does not amount to 10 per cent in any group except the one over 300 miles.

Table 81: Distribution of consignments by time taken in selected industries

| Time                | Industry                        |                        |                           |                          |                      | Percentage |
|---------------------|---------------------------------|------------------------|---------------------------|--------------------------|----------------------|------------|
|                     | Foodstuffs<br>(MLH 214,<br>218) | Chemicals<br>(MLH 271) | Iron & steel<br>(MLH 311) | Electronics<br>(MLH 384) | Paper<br>(MLH 481-2) |            |
| Same day            | 46                              | 35                     | 37                        | 35                       | 39                   |            |
| Not more than 1 day | 11                              | 17                     | 26                        | 24                       | 13                   |            |
| 2 days              | 23                              | 13                     | 15                        | 8                        | 12                   |            |
| 3 days              | 3                               | 8                      | 10                        | 11                       | 4                    |            |
| 4 days              | 1                               | 13                     | 5                         | 7                        | 7                    |            |
| 5 days              | 12                              | 6                      | 3                         | 3                        | 6                    |            |
| 6 days              | 1                               | 4                      | 3                         | 4                        | 3                    |            |
| 7 or more days      | 4                               | 6                      | 6                         | 6                        | 14                   |            |
|                     | 100                             | 100                    | 100                       | 100                      | 100                  |            |

Source: Commodity Survey

Table 82: Percentage of consignments delivered same day, etc

|                | Length of haul (miles) |           |            |            |            |     |
|----------------|------------------------|-----------|------------|------------|------------|-----|
|                | Over<br>Not over 50    | 50<br>100 | 100<br>150 | 150<br>200 | 200<br>300 | 300 |
| Same day       | 47                     | 32        | 23         | 34         | 21         | 9   |
| Next day       | 15                     | 22        | 17         | 24         | 17         | 11  |
| 2 days         | 21                     | 13        | 14         | 14         | 19         | 17  |
| 3 days         | 6                      | 12        | 12         | 6          | 14         | 15  |
| 4 days         | 4                      | 3         | 7          | 7          | 10         | 11  |
| 5 days         | 3                      | 4         | 17         | 7          | 5          | 8   |
| 6 days         | 2                      | 3         | 3          | 4          | 6          | 18  |
| 7 days or more | 2                      | 4         | 7          | 4          | 8          | 11  |

Source: General Survey

Distribution of consignments by size and delivery time, etc

In addition to an examination of the distribution of consignments by various permutations on the type of commodity involved, other analyses of the data have yielded information on the distribution of consignments by size and length of haul, size and time taken, and so on. Since four variables\* are involved there are six possible permutations and although each has been examined, not every analysis has proved fruitful whereas others have tended to state the obvious. For example, the analysis by regularity of consignments and time taken for the journey showed an expected high proportion of consignments of a regularity described as more than once a day to be same day deliveries. Similarly, most daily consignments were delivered on the same day as they were despatched. Less regular consignments generally took longer to deliver, with the time taken in transit progressively increasing as the regularity decreased. This latter is partly a function of length of haul, however, since a higher proportion of the more irregular consignments moved over the longer distances.

The analysis of size of consignment against distance transported showed remarkably little variation between the size groups except that there were relatively few consignments of ten tons and over moved less than 25 miles while an above average number were consigned over distances of 150 to 300 miles. On further analysis, however, this was found to be partly due to the nature of the commodity involved since a relatively high proportion of consignments of ten tons or more consist of either chemicals or iron and steel products. Few other commodities were consigned in such large quantities, and when the relatively small number of such consignments occurred, there was not a very marked difference between the distribution of the large consignments by length of haul and that of smaller consignments. In general, therefore, increased size of consignment cannot be equated with longer hauls.

The tabulation of weight against time taken revealed that the larger the consignment the greater the likelihood of same day delivery, and although this could be due to the nature of the commodities involved, secondary analysis revealed that the influence of the commodity is not so conclusive as in the previous analysis so that there is a real tendency for the larger consignments, on average, to be delivered more speedily than the smaller ones.

The influence of the commodity is also a possibility in the analysis of weight against regularity. Thus, although the most regular (ie more than once a day) consignments tend to be the heavier ones, this is partly due to the product involved, as a relatively high proportion of these consignments are of building materials and iron and steel products, which are above average in weight of consignment, while at the other extreme a high percentage of irregular consignments are of finished manufactured goods, which are despatched mainly in very small parcels. On the other hand, there is sufficient evidence for the generalisation that consignments of half ton and over are made with a greater degree of regularity (ie at least weekly) than smaller consignments, a relatively high proportion of which are extremely irregular.

\*ie weight, length of haul, regularity, time taken.

Table 83: Distribution of consignments by size and length of haul

|           |          | Percentage             |    |    |     |     |     |     |     |               |
|-----------|----------|------------------------|----|----|-----|-----|-----|-----|-----|---------------|
|           |          | Length of haul (miles) |    |    |     |     |     |     |     |               |
| Size      |          | Over                   | 25 | 50 | 75  | 100 | 125 | 150 | 200 | All distances |
| Over      | Not over | Not over 25            | 50 | 75 | 100 | 125 | 150 | 200 | 300 |               |
| 22 lbs    | 22 lbs   | 25                     | 14 | 10 | 7   | 9   | 3   | 12  | 13  | 5             |
| 112 "     | 112 "    | 35                     | 11 | 9  | 7   | 9   | 3   | 9   | 9   | 6             |
| 500 "     | 500 "    | 30                     | 12 | 9  | 8   | 9   | 7   | 10  | 8   | 7             |
| 1120 "    | 1120 "   | 34                     | 16 | 7  | 7   | 5   | 10  | 9   | 7   | 3             |
| 2240 "    | 2240 "   | 47                     | 14 | 5  | 7   | 3   | 6   | 7   | 6   | 3             |
| 1 ton     | 5 tons   | 35                     | 14 | 7  | 8   | 9   | 5   | 9   | 12  | 3             |
| 5 tons    | 10 "     | 26                     | 16 | 9  | 7   | 11  | 5   | 11  | 10  | 3             |
| 30 "      |          | 14                     | 16 | 7  | 8   | 8   | 7   | 17  | 20  | 3             |
| All sizes |          | 35                     | 15 | 8  | 6   | 8   | 5   | 10  | 9   | 4             |

Source: General Survey

Table 84: Distribution of consignments by size and time taken

|           |          | Percentage |          |        |        |        |        |        |                |
|-----------|----------|------------|----------|--------|--------|--------|--------|--------|----------------|
|           |          | Time taken |          |        |        |        |        |        |                |
| Size      |          | Same day   | Next day | 2 days | 3 days | 4 days | 5 days | 6 days | 7 or more days |
| Over      | Not over |            |          |        |        |        |        |        | Total          |
| 22 lbs    | 22 lbs   | 28         | 21       | 24     | 15     | 5      | 2      | 3      | 3              |
| 112 "     | 112 "    | 20         | 13       | 15     | 8      | 14     | 14     | 8      | 8              |
| 500 "     | 500 "    | 28         | 13       | 10     | 9      | 9      | 16     | 9      | 8              |
| 1120 "    | 1120 "   | 38         | 24       | 10     | 6      | 4      | 7      | 2      | 9              |
| 2240 "    | 2240 "   | 49         | 37       | 4      | 3      | 5      | 3      | 4      | 5              |
| 1 ton     | 5 tons   | 48         | 25       | 9      | 7      | 3      | 3      | 1      | 4              |
| 5 tons    | 10 "     | 47         | 17       | 15     | 15     | 3      | 1      | 1      | 1              |
| 10 "      |          | 68         | 8        | 18     | 1      | 3      | 2      | —      | —              |
| All sizes |          | 31         | 18       | 17     | 10     | 8      | 7      | 4      | 5              |

Source: General Survey

Table 85: Distribution of consignments by size and regularity

|           |          | Percentage           |       |        |             |         |           |
|-----------|----------|----------------------|-------|--------|-------------|---------|-----------|
|           |          | Regularity           |       |        |             |         |           |
| Size      |          | More than once a day | Daily | Weekly | Fortnightly | Monthly | Irregular |
| Over      | Not over |                      |       |        |             |         |           |
| 22 lbs    | 22 lbs   | 1                    | 10    | 13     | 8           | 11      | 57        |
| 112 "     | 112 "    | —                    | 25    | 22     | 6           | 12      | 35        |
| 500 "     | 500 "    | —                    | 18    | 34     | 6           | 11      | 31        |
| 1120 "    | 1120 "   | —                    | 5     | 33     | 6           | 9       | 27        |
| 2240 "    | 2240 "   | 1                    | 3     | 59     | 13          | 9       | 15        |
| 1 ton     | 5 tons   | 5                    | 7     | 50     | 12          | 9       | 17        |
| 5 tons    | 10 "     | 7                    | 18    | 49     | 5           | 5       | 25        |
| 30 "      |          | 12                   | 13    | 50     | 9           | 5       | 11        |
| All sizes |          | 1                    | 25    | 28     | 7           | 9       | 30        |

Source: General Survey

Table 86: Distribution of consignments by length of haul and regularity

|               |          | Percentage           |       |        |             |         |           |
|---------------|----------|----------------------|-------|--------|-------------|---------|-----------|
|               |          | Regularity           |       |        |             |         |           |
| Length        |          | More than once a day | Daily | Weekly | Fortnightly | Monthly | Irregular |
| Over          | Not over |                      |       |        |             |         |           |
| 25 miles      | 50 "     | 1                    | 49    | 25     | 5           | 5       | 15        |
| 50 "          | 75 "     | 2                    | 30    | 27     | 6           | 4       | 31        |
| 75 "          | 100 "    | 1                    | 6     | 34     | 5           | 10      | 44        |
| 100 "         | 125 "    | 1                    | 12    | 34     | 5           | 8       | 40        |
| 125 "         | 150 "    | 4                    | 8     | 23     | 9           | 20      | 36        |
| 150 "         | 200 "    | 1                    | 5     | 25     | 8           | 12      | 48        |
| 200 "         | 300 "    | 1                    | 5     | 40     | 10          | 15      | 29        |
| 300 "         |          | 1                    | 4     | 32     | 7           | 12      | 44        |
| All distances |          | 1                    | 25    | 28     | 7           | 9       | 30        |

Source: General Survey

## Expenditure, Charges and Tonnage Generated

Three broad topics are considered in this Chapter: firstly, the annual expenditure on and tonnages shipped by various modes of transport in selected industries; secondly, the charges for consignments in the General Survey; and thirdly, the charges for consignments in selected industries, in the Commodity Survey.

### Expenditure on transport in selected industries

The 1963 Census of Production collected, for the first time, details on expenditure on transport on own account, previous censuses having only collected information on payments to professional transport carriers. It is possible, therefore, to compare the results of the Commodity Survey and those of the Census with respect to the importance of transport costs in turnover.

For Iron and Steel, Electronic equipment and Paper there is little or no difference between the figures, but for Foodstuffs and Chemicals rather more substantial differences occur. The difference in both these instances seems from two sources: firstly, the size bias in the Commodity Survey has reduced the overall figures as expenditures on transport as a proportion of turnover is significantly lower for large establishments than for small; and secondly, the comparison is not being made between exactly similar industrial groupings as a sufficient breakdown was not given in the provisional results of the Census. Minimum List Headings 214 and 215 were included in the remainder group—other food industries—as was MLI 271 in other chemicals and allied industries.

Table 87: Expenditure on transport as a percentage of turnover

| Size<br>(employees) | Nature of Business              |                        |                                |                                      |                      |
|---------------------|---------------------------------|------------------------|--------------------------------|--------------------------------------|----------------------|
|                     | Foodstuffs<br>(MLH 214,<br>215) | Chemicals<br>(MLH 271) | Iron and<br>Steel<br>(MLH 311) | Electronic<br>equipment (MLH<br>365) | Paper<br>(MLH 413-3) |
| Over 499            | 1.9                             | 2.6                    | 2.2                            | 0.6                                  | 3.3                  |
| 100-499             | 3.3                             | 2.3                    | 4.3                            | 0.7                                  | 3.2                  |
| Under 100           | 2.9                             | 4.2                    | 3.4                            | 1.1                                  | 3.3                  |
| Not known           | —                               | —                      | —                              | 0.7                                  | —                    |
| Total               | 2.4                             | 2.1                    | 2.4                            | 0.8                                  | 3.3                  |
| 1963 Census         | 4.3                             | 3.5                    | 2.5                            | 0.8                                  | 3.3                  |

Source: Commodity Survey

Note: The Census figures are provisional ones.

It is readily apparent that even for low value products transport costs are only a minor portion of total costs, and that for high value products such as Electronic goods they are an insignificant part of total costs.<sup>1</sup>

#### Distribution of expenditure and tonnage between modes

The distribution of tonnage and expenditure amongst the different modes of transport for selected industries is given in the Table below. The proportions for expenditure and tonnage differ significantly in two instances—Foodstuffs and Iron and Steel. Comment on this is, however, of limited value for it is impossible to say whether it is the commodity being carried or a combination of other factors that is resulting in the differences. Foodstuffs are, for instance, shipped in smaller consignments and over shorter distances than Iron and Steel so these factors have a bearing on expenditure as well as the nature of the commodity. All factors influencing expenditure must, therefore, be considered simultaneously and consideration of this point is delayed until p. 86 et seq. The Table does, nevertheless, allow a comparison to be made of the relative use of different modes within specific industries and this is done in the following paragraphs.

<sup>1</sup> For a fuller discussion of the importance of transport expenditure in manufacturing industry see 'The cost of transport in British industry'—a report prepared by S. L. Edwards for the Ministry of Transport and due to be published when final results of the census are available.

Table 68: Expenditure on and tonnages shipped by each mode of transport, analysed by Nature of Business

|                | '000's         |                 |                  |                  |                  |                  |                      |                |                 |                  |
|----------------|----------------|-----------------|------------------|------------------|------------------|------------------|----------------------|----------------|-----------------|------------------|
|                | Foodstuffs     |                 | Chemicals        |                  | Iron and Steel   |                  | Electronic equipment |                | Paper           |                  |
|                | Tons           | £'s             | Tons             | £'s              | Tons             | £'s              | Tons                 | £'s            | Tons            | £'s              |
| Own Vehicles   | 153.1<br>29.3% | 694.2<br>44.4%  | 1,866.4<br>17.9% | 3,343.6<br>21.6% | 3,664.3<br>32.1% | 1,208.1<br>10.5% | 94.3<br>56.8%        | 115.5<br>50.0% | 645.7<br>37.5%  | 1,333.4<br>35.1% |
| Own Vessel     | —              | —               | 154.8<br>1.5%    | 205.5<br>1.3%    | 7.3<br>0.1%      | 7.5<br>0.1%      | —                    | —              | —               | —                |
| Haailer        | 307.1<br>59.0% | 658.2<br>44.6%  | 4,139.7<br>39.7% | 7,180.0<br>46.4% | 3,672.9<br>36.8% | 5,767.7<br>51.4% | 89.4<br>61.6%        | 238.5<br>37.7% | 968.3<br>57.9%  | 1,228.5<br>63.6% |
| Rail           | 37.7<br>11.1%  | 189.3<br>10.8%  | 4,015.4<br>38.6% | 6,427.9<br>28.6% | 3,173.2<br>30.3% | 4,140.5<br>37.2% | 1.9<br>1.2%          | 39.7<br>6.3%   | 70.2<br>4.1%    | 427.2<br>1.4%    |
| Outside Vessel | 0.2<br>—       | 1.7<br>0.1%     | 239.1<br>2.3%    | 299.4<br>1.9%    | 2.5<br>—         | 5.1<br>—         | 0.2<br>0.1%          | 2.4<br>0.4%    | 6.5<br>0.4%     | 23.0<br>0.3%     |
| GPO            | —              | 0.4<br>—        | 0.4<br>—         | 26.3<br>0.2%     | —                | 5.8<br>0.1%      | 0.3<br>0.2%          | 31.3<br>5.0%   | 1.5<br>0.1%     | 112.4<br>2.8%    |
| Other          | 3.1<br>0.6%    | 1.1<br>0.4%     | —                | 1.4<br>—         | —                | 0.5<br>—         | 0.1<br>0.1%          | 4.1<br>0.6%    | —               | 0.3<br>—         |
| Total          | 520.2<br>100%  | 1,566.9<br>100% | 10,413.6<br>100% | 15,479.1<br>100% | 10,935.0<br>100% | 11,128.8<br>100% | 165.9<br>100%        | 631.5<br>100%  | 1,722.2<br>100% | 5,072.6<br>100%  |

Source: Commodity Survey

Note: (1) Only establishments are included that give both tonnage and expenditure figures.

(2) Vessel refers to both inland waterway and coastal vessels.

(3) Tonnage relates to both incoming and outgoing traffic, so that the figures can be related to expenditure.



Amongst the minor carriers there are few surprises; of the five selected industries the most important user of canal and coastal vessels is the Chemical industry, and as might have been expected, the Paper industry is an important user of the c/o. It is perhaps surprising that the Electronic equipment industry is *relatively* the most important user of the c/o but clearly many small electronic instruments can be safely packed for transit through the post. Customer collection is excluded from the table so as to allow an exact comparison between expenditure and tonnage, but in the Table below customer collection is compared with transport on own account for all establishments that gave tonnage figures.

The features of customer collection that stand out are its greater importance for large firms than small, and its absolute importance in the Chemical and Iron and Steel industries. Indeed in Chemicals it is almost as important as transport on own account and for large firms is even more important.

Amongst the main carriers (transport on own account, road haulage and rail) there are, however, a number of surprises. In the Table below the Commodity Survey results are compared with those of the 1962 Road Goods Transport Survey, distributive trades being excluded from the latter to make the comparison more exact.

The distributions in the two Surveys are somewhat dissimilar but with the exception of chemicals they are not greatly dissimilar. The most common factor is a more frequent use of rail in the Commodity Survey compared with the 1962 Survey. Any question of a movement to rail during the interval between the two Surveys can be excluded, for although there has recently been a movement towards rail prior to this there was a greater net movement away from rail (see pp. 66). Two possible factors

explain the disparity; firstly, the size bias in the Commodity Survey, and secondly, the difference in the industry groupings used in the two Surveys. These points are dealt with on an industry basis in the following paragraphs.

Table 89: Tonnages shipped by Own Vehicles and Customer Collection in selected industries analysed by size of establishment

| Nature of Business   | Customer Collection |         |           |         | Transport on own Account |         |           |         |
|----------------------|---------------------|---------|-----------|---------|--------------------------|---------|-----------|---------|
|                      |                     |         |           |         |                          |         |           |         |
|                      | Over 499            | 100-499 | Under 100 | Total   | Over 499                 | 100-499 | Under 100 | Total   |
| Foodstuffs           | 1-5                 | 0-9     | 0-4       | 4-8     | 32-4                     | 93-1    | 33-4      | 159-9   |
| Chemicals            | 1,849-8             | 117-3   | 19-3      | 1,986-4 | 1,218-2                  | 333-8   | 92-5      | 1,644-5 |
| Iron and Steel       | 615-1               | 24-4    | 1-2       | 640-7   | 3,259-0                  | 186-4   | 28-7      | 3,464-1 |
| Electronic equipment | 0-3                 | 1-5     | —         | 1-6     | 68-9                     | 22-3    | —         | 90-6    |
| Paper                | 17-3                | 10-1    | 0-6       | 28-0    | 326-6                    | 347-0   | 63-4      | 637-4   |

Source: Commodity Survey

Table 90: The Commodity Survey and 1962 Road Goods Transport Survey results compared with respect to distribution of tonnages shipped

| Nature of Business   | 1962 Survey |      |      | Commodity Survey |      |      |       |
|----------------------|-------------|------|------|------------------|------|------|-------|
|                      |             |      |      |                  |      |      |       |
|                      | Own Vehicle | Road | Rail | Own Vehicle      | Road | Rail | Other |
| Foodstuffs           | 42          | 31   | 7    | 29               | 59   | 11   | 1     |
| Chemicals            | 45          | 45   | 9    | 18               | 40   | 39   | 4     |
| Iron and Steel       | 25          | 44   | 27   | 33               | 37   | 30   | —     |
| Electronic equipment | 51          | 47   | 1    | 57               | 42   | 1    | —     |

Note: (1) Paper could not be differentiated in the 1962 Survey.

(2) The industry groupings in the two Surveys are not strictly comparable due to the wider groupings in the 1962 Survey.

## Foodstuffs

The difference between the two Surveys in the Foodstuffs industry is caused solely by the size bias in the Commodity Survey as the large establishments make proportionately a much more frequent use of road hauliers and rail than do the smaller ones (see Table below); large establishments sending less than one-fourth of their traffic in their own vehicles compared with half and three quarters for medium and small firms respectively.

Table 91: Distribution of tonnage according to size of establishment in the Foodstuffs industry (MLH's 214 and 218).

| '000 tons in 1967 |             |         |      |       |       |
|-------------------|-------------|---------|------|-------|-------|
| Size (employees)  | Own vehicle | Haulier | Rail | Other | Total |
| Over 400          | 22.4        | 239.9   | 38.9 | 0.1   | 299.3 |
| per cent          | 7.6         | 78.7    | 13.6 | 0.1   | 100   |
| 100-400           | 32.8        | 64.9    | 17.5 | 3.2   | 178.4 |
| per cent          | 52.0        | 36.4    | 9.4  | 1.8   | 100   |
| Under 100         | 36.9        | 11.3    | 0.5  | —     | 48.5  |
| per cent          | 76.1        | 23.9    | 0.6  | —     | 100   |
| Total             | 152.1       | 307.1   | 57.7 | 3.3   | 539.2 |
| per cent          | 28.3        | 59.0    | 11.2 | 0.6   | 100   |

Source: Commodity Survey

The frequent use of public carriers by the large establishments would lead one to assume that because of the large scale of their shipments they are able to obtain more favourable rates than the smaller firms, and that these rates are below the cost of operating their own fleets. In the Table below expenditure per ton is compared with the average annual tonnage shipped per establishment, and it can be seen that this is very much the case with costs of road haulage well below that of transport on own account. Elsewhere in the Table there are a number of deviations from the expected pattern. Looking along the rows low costs and high tonnages go together for the large and small establishments but this is not the case with the medium establishments; and looking down the columns the economies of bulk shipping are very apparent in road haulage but rail and own vehicles do not conform to this with respect to

medium and small firms respectively. The very low cost of transport on own account operation with respect to the small firms results from the operations of one firm in the sample which sent very large quantities to local destinations, but there is no ready explanation of the very low cost of rail for medium firms.

There is a general tendency for low costs and high tonnages to be associated, it is, however, impossible to establish a one-directional causation, ie shippers ship by low price modes and the large shipments reduce the price. Nevertheless, even though some relationship is apparent it is clear that a great many other factors besides bulk shipping influence price, and that price is not the only factor influencing choice.<sup>1</sup>

The interesting fact that emerges from the analysis is that although it is frequently argued that the perishability of the product and shortness of the hauls results in frequent use of transport on own account in the Foodstuffs industry this is certainly not the case with large firms.

## Chemicals

Chemicals is the industry where there is a vast difference between the 1962 Road Goods Survey and the Commodity Survey, the latter showing a much greater use of rail at the expense of transport on own account compared with the former. This is again partially explained by the size bias in the Commodity Survey with large establishments shipping nearly half of their traffic by rail compared with less than one-twentieth for both medium and small firms (see Table below) but there is also an important difference in the industrial groupings in the two Surveys. Minimum list heading 271 used in the Commodity Survey includes a greater concentration of large establishments than the remainder of the chemical industry, and although only 5 per cent of the establishments in the industry were picked up in the Commodity Survey they accounted for over one-quarter of the industry's total turnover (see Appendix I).

This frequent use of rail is gained at the expense of transport on own account with large firms sending only about one-tenth of their traffic by this latter mode compared with over one-half for medium and small firms. Clearly chemicals is one of the industries where there is the possibility of shipping in train loads

Table 93: Distribution of tonnage according to size of establishment in the Chemicals industry (MLH 271)

| '000 tons in 1962 |             |         |         |            |                |       |          |
|-------------------|-------------|---------|---------|------------|----------------|-------|----------|
| Size (employees)  | Own Vehicle | Haulier | Rail    | Own Vessel | Outside Vessel | Other | Total    |
| Over 400          | 1,209.1     | 3,650.5 | 3,596.7 | 133.3      | 238.7          | 0.2   | 8,828.5  |
| per cent          | 13.9        | 39.1    | 42.8    | 1.6        | 2.6            | —     | 100      |
| 100-400           | 686.9       | 638.0   | 22.6    | 3.5        | 0.4            | 0.2   | 948.6    |
| per cent          | 50.8        | 46.4    | 2.4     | 0.4        | —              | —     | 100      |
| Under 100         | 92.4        | 30.2    | 2.1     | —          | —              | —     | 144.7    |
| per cent          | 63.9        | 24.7    | 1.4     | —          | —              | —     | 100      |
| Total             | 1,888.4     | 4,339.7 | 4,015.4 | 154.8      | 239.1          | 0.4   | 10,617.8 |
| per cent          | 17.9        | 39.7    | 38.6    | 1.5        | 2.3            | —     | 100      |

Source: Commodity Survey

<sup>1</sup> The inter-relationship of the factors influencing the choice is discussed at length later in this Chapter, and the importance of price in modal choice is discussed on pages 49 and 50.

Table 92: Expenditure per ton and annual tonnage shipped per establishment in the Foodstuffs industry (MLH's 214 and 218).

| Size (employees)             | Own Vehicle | Haulier | Rail  | Total  | Number of Establishments |
|------------------------------|-------------|---------|-------|--------|--------------------------|
| Over 400 tons/establishment  | 3,735       | 36,462  | 6,640 | 46,837 | 6                        |
| 100-400 tons/establishment   | 7.5         | 1.9     | 3.1   | 2.5    | 23                       |
| Under 100 tons/establishment | 4,034       | 2,820   | 764   | 7,756  | 13                       |
| ton/establishment            | 4.8         | 3.4     | 2.4   | 4.0    |                          |
| ton/establishment            | 2,837       | 870     | 23    | 3,730  |                          |
| ton/establishment            | 2.1         | 4.0     | 13.9  | 2.6    |                          |
| Total                        | 3,620       | 1,311   | 1,374 | 12,385 | 42                       |
| ton/establishment            | 4.6         | 2.3     | 2.9   | 3.0    |                          |

Source: Commodity Survey

at very low cost and an examination of the Table below shows that large firms are able to take advantage of this.

Again the same type of features are appearing here as in Foodstuffs with the expenditure per ton of small firms unexpectedly low. Transport on own account is cheaper for large firms than road hauliers although three times the traffic is sent by the latter mode. The explanation again lies in the use of different modes by shippers for different types of traffic. For example the low cost of transport on own account for large

firms is probably because of the relatively short hauls, and the low costs per ton of small firms for all modes is possibly because they serve small local markets than the large ones. It is the huge number of factors that influence charges that makes it very difficult to draw conclusions from the above table, but the analysis does, nevertheless, serve to explain the difference between the 1962 Survey and the Commodity Survey, and provide other useful information.

Table 94: Expenditure per ton and annual tonnage shipped per establishment in the Chemicals industry (MLH 271)

| Size                           | Own Vehicle    | Haulier        | Rail           | Own Vessel    | Outside Vessel | Total          |
|--------------------------------|----------------|----------------|----------------|---------------|----------------|----------------|
| Over 499 tons/estab.<br>£/ton  | 107,740<br>1.4 | 304,289<br>1.8 | 332,537<br>1.1 | 12,612<br>1.3 | 18,882<br>1.2  | 777,045<br>1.4 |
| 180-499 tons/estab.<br>£/ton   | 26,085<br>1.1  | 18,289<br>1.3  | 943<br>0.5     | 146<br>0.9    | 17<br>6.7      | 39,441<br>2.4  |
| Under 180 tons/estab.<br>£/ton | 5,779<br>0.8   | 3,137<br>2.2   | 128<br>2.4     | —             | —              | 9,045<br>1.3   |
| Total tons/estab.<br>£/ton     | 33,892<br>1.8  | 79,689<br>1.7  | 77,219<br>1.4  | 2,978<br>1.3  | 4,598<br>1.3   | 290,305<br>1.5 |

Source: Commodity Survey

Notes: Vessel refers to both coastal and inland waterway vessels.

### Iron and Steel

The Iron and Steel industry in contrast to Chemicals and Foodstuffs shows a more frequent use of transport on own account in the Commodity Survey than in the 1962 Road Goods Survey. This is not caused by the size bias as, in this instance, there is a below average number of small establishments in the industry.

The distribution of traffic for the different sized firms in the Iron and Steel industry is fascinating. Traffic from the large firms is spread fairly evenly amongst all main modes, whereas medium sized firms send 80 per cent of their traffic by road haulier and practically all of the remainder by their own fleets (see Table 95). In the particular minimum list heading (311) chosen for the Iron and Steel industry in the Commodity Survey there is a greater concentration of large firms than in the remainder of the industry, and it is probably this fact which explains the smaller share of road haulage in the Commodity Survey compared with the 1962 Survey.<sup>1</sup>

Iron and Steel, like Chemicals, is an industry where goods can be shipped in great bulk at low cost. For the large establishments where the very large flows allow use to be made of train load facilities great quantities are shipped by rail. Surprisingly the expenditure per ton of transport on own account is well below that of other modes for all size groups (see Table 96); the exceptionally low figure for large establishments is explained by the fact that one very large establishment has included internal works traffic, but the generally low figure for establishments of all sizes results from the use of this mode for relatively short hauls whereas the public carriers, are used for the long hauls (see Part II Chapter 2).

<sup>1</sup> This is illustrated by the fact that although the Commodity Survey only picked up 15% of the establishments in the Iron and Steel industry they were responsible for over one-third of the total turnover of the industry (see Appendix).

Table 95: Distribution of tonnage according to size of establishment in the Iron and Steel industry (MLH 311)

'000 tons in 1963

| Size (employees) | Own Vehicle | Harbour | Rail    | Own Vessel | Outside Vessel | Other | Total    |
|------------------|-------------|---------|---------|------------|----------------|-------|----------|
| Over 499         | 3,380.6     | 5,739.6 | 2,533.6 | 7.2        | 2.5            | —     | 1,416.9  |
| per cent         | 37.5        | 32.5    | 29.9    | 0.1        | —              | —     | 100      |
| 100-499          | 104.6       | 767.9   | 6.5     | —          | —              | —     | 219.4    |
| per cent         | 19.3        | 99.0    | 0.7     | —          | —              | —     | 100      |
| Under 100        | 16.6        | 19.3    | —       | —          | —              | —     | 35.9     |
| per cent         | 55.1        | 44.5    | 0.2     | —          | —              | —     | 100      |
| Not known        | 62.6        | 332.6   | 633.1   | —          | —              | —     | 1,028.3  |
| per cent         | 6.0         | 32.2    | 63.8    | —          | —              | —     | 100      |
| Total            | 3,664.4     | 5,872.8 | 3,179.2 | 7.2        | 2.5            | —     | 12,526.0 |
| per cent         | 32.8        | 36.8    | 39.3    | 0.1        | —              | —     | 100      |

Source: Commodity Survey

Note: Although the Not Known tonnages are very high they relate to only 3 establishments so they can be presumed to all belong to the over 499 group.

Table 96: Expenditure per ton and annual tonnage shipped per establishment in the Iron and Steel industry (MLH 311)

| Size (employees) | Own Vehicle          | Harbour        | Rail           | Own Vessel     | Outside Vessel | Total          |
|------------------|----------------------|----------------|----------------|----------------|----------------|----------------|
| Over 499         | tons/estab.<br>£/ton | 167,421<br>0.5 | 145,261<br>1.4 | 133,344<br>1.2 | 180<br>1.0     | 446,006<br>0.9 |
| 100-499          | tons/estab.<br>£/ton | 95,858<br>0.7  | 45,139<br>1.3  | 582<br>2.9     | 2.1            | 56,179<br>1.2  |
| Under 100        | tons/estab.<br>£/ton | 5,511<br>1.3   | 4,437<br>2.4   | 17<br>6.0      | —              | 9,964<br>1.8   |
| Not known        | tons/estab.<br>£/ton | 20,833<br>0.9  | 110,867<br>2.2 | 212,992<br>1.8 | —              | 344,692<br>1.9 |
| Total            | tons/estab.<br>£/ton | 32,096<br>0.3  | 92,211<br>1.5  | 75,671<br>1.3  | 172<br>1.0     | 200,119<br>1.1 |

Source: Commodity Survey

### Electronic equipment

The Electronics industry is similar to the Iron and Steel industry in that there are comparatively few small establishments so the size bias is minimal in this instance. As the Minimum List Heading (364) chosen for Electronic equipment is a comparatively heterogeneous grouping there is also very little industry bias with respect to the 1962 Survey. The lack of these two possible biases, therefore, leads to a very similar distribution of traffic in the two Surveys.

There is very little difference in the allocation of traffic of large and medium establishments, with transport on own account and road haulage being responsible for all but a fraction of the total traffic (see Table 97). Small firms although also favouring these two modes also sent about one-tenth of their traffic by Rail and sea but a great deal of reliance cannot be placed upon this figure as the number of observations is so low.

The relatively little use made of rail in this industry is probably accounted for by the risk of damage involved in a number of transshipments, but as was previously noted the introduction of liner trains and containerisation seems likely to make rail a more popular mode in future for this industry.

As in previous instances some evidence of the economies of bulk shipping is apparent in the body of Table 98 but there

is no well defined relationship. There are, however, few exceptions in either the total row or total column, with the distribution of tonnages and expenditure per ton bearing an inverse relationship to one another.

Table 97: Distribution of tonnage according to size of establishment in the Electronic equipment industry (MLH 364)

'000 tons in 1963

| Size (employees) | Own Vehicle | Harbour | Rail | GPO  | Other | Total |
|------------------|-------------|---------|------|------|-------|-------|
| Over 499         | 68.1        | 34.8    | 1.0  | 0.1  | 0.2   | 104.2 |
| per cent         | 52          | 44      | 1    | —    | —     | 100   |
| 100-499          | 21.4        | 14.3    | 0.9  | 0.2  | 0.1   | 37.9  |
| per cent         | 58          | 38      | 3    | 1    | —     | 100   |
| Under 100        | 0.08        | 0.03    | 0.00 | 0.01 | —     | 0.12  |
| per cent         | 63          | 25      | 6    | 7    | —     | 100   |
| Not known        | 4.3         | —       | 0.02 | —    | —     | 4.6   |
| per cent         | 98          | —       | 1    | —    | —     | 100   |
| Total            | 94.8        | 69.1    | 1.9  | 0.3  | 0.3   | 166.4 |
| per cent         | 36.8        | 41.6    | 1.2  | 0.2  | 0.2   | 100   |

Source: Commodity Survey

**Table 98: Expenditure per ton and annual tonnage shipped per establishment in the Electronic equipment industry (MLH 364)**

| Size (employees) |                      | Own Vehicle  | Handler      | Rail       | G.P.O.      | Total        |
|------------------|----------------------|--------------|--------------|------------|-------------|--------------|
| Over 499         | tons/estab.<br>£/ton | 4,568<br>2.6 | 3,913<br>3.6 | 70<br>23.6 | 10<br>104.1 | 4,574<br>3.5 |
| 100-499          | tons/estab.<br>£/ton | 396<br>4.8   | 619<br>3.9   | 40<br>18.2 | 9<br>84.8   | 1,619<br>4.6 |
| Under 100        | tons/estab.<br>£/ton | 25<br>20.9   | 10<br>23.3   | 2<br>14.9  | 3<br>68.6   | 40.1<br>34.1 |
| Not known        | tons/estab.<br>£/ton | 4,313<br>3.6 | —            | 17<br>22.6 | 1<br>43.0   | 4,331<br>3.7 |
| Total            | tons/estab.<br>£/ton | 3,300<br>3.3 | 1,665<br>3.5 | 47<br>26.6 | 8<br>58.7   | 4,967<br>3.8 |

Source: Commodity Survey

## Paper

The allocation of traffic for the Paper industry cannot be compared with the 1962 Survey as it was not possible to separate out this industry in the latter Survey. Paper is an industry where there are large numbers of small firms, and from the Table below it can be seen that the size bias in the Survey is probably over emphasising the use made of road haulage in the industry as a whole.

Perhaps a surprising feature about the distribution of traffic in this industry is the infrequent use made of rail. One would have thought that with the large tonnages shipped from mills and with the incidence of private rail sidings in this industry that a substantial amount of traffic would have been earned by rail, but even for large establishments it is responsible for less than 5 per cent of total traffic. Small firms send three-quarters of their traffic by their own transport and one-quarter by public carriers but as the size of firm increases there is a change of emphasis and for large firms the roles are completely reversed with transport on own account responsible for only about one-quarter of the traffic.

As has been the case previously the expenditure per ton of small firms is in some instances lower than for larger firms (see Table below), but the reason is again probably explained by the smaller distances involved for small firms rather than a refutation of the economies of bulk shipping segment.

**Table 99: Distribution of tonnage according to size of establishment in the Paper industry (MLH's 481-3)**

'000 tons in 1965

| Size (employees) | Own Vehicle | Handler | Rail | Outside Vessel | GPO | Other | Total   |
|------------------|-------------|---------|------|----------------|-----|-------|---------|
| Over 499         | 336.2       | 503.6   | 54.7 | 6.2            | 1.6 | —     | 1,202.9 |
| per cent         | 28          | 42      | 4    | 1              | ..  | —     | 100     |
| 100-499          | 346.6       | 173.8   | 12.8 | 0.4            | 0.4 | —     | 434.0   |
| per cent         | 57          | 40      | 3    | ..             | ..  | —     | 100     |
| Under 100        | 63.4        | 13.7    | 2.7  | —              | —   | —     | 84.0    |
| per cent         | 75          | 22      | 3    | —              | —   | —     | 100     |
| Not known        | 0.3         | —       | —    | —              | —   | —     | 0.3     |
| per cent         | 90          | —       | 1    | —              | —   | 9     | 100     |
| Total            | 645.7       | 690.3   | 70.2 | 6.6            | 1.4 | —     | 1,732.2 |
| per cent         | 37          | 38      | 4    | 1              | ..  | —     | 100     |

Source: Commodity Survey

**Table 100: Expenditure per ton and annual tonnage shipped per establishment in the Paper industry (MLH's 481-3)**

| Size      | Own Vehicle          | Handler       | Rail          | Outside Vessel | GPO        | Total         |
|-----------|----------------------|---------------|---------------|----------------|------------|---------------|
| Over 499  | tons/estab.<br>£/ton | 14,308<br>1.4 | 40,189<br>3.1 | 2,736<br>5.6   | 307<br>3.3 | 60,185<br>2.9 |
| 100-499   | tons/estab.<br>£/ton | 6,165<br>3.3  | 4,245<br>3.6  | 329<br>7.4     | 30<br>4.3  | 10,830<br>3.3 |
| Under 100 | tons/estab.<br>£/ton | 2,237<br>1.4  | 668<br>3.2    | 94<br>7.9      | —          | 3,001<br>2.5  |
| Not known | tons/estab.<br>£/ton | 338<br>8.1    | —             | 3<br>16.0      | —          | 365<br>8.4    |
| Total     | tons/estab.<br>£/ton | 7,254<br>2.6  | 11,317<br>3.2 | 769<br>6.1     | 74<br>3.5  | 19,350<br>2.9 |

Source: Commodity Survey

## Conclusions

With medium sized firms in the Iron and Steel industry the only exception, the larger the firm the less use, proportionally, is made of transport on own account; and with the exception of Electronic equipment, for which quantities are very small, the larger the firm the greater is the use made of rail. A pattern in road haulage is also apparent; without exception more use is made proportionately of this form of transport by medium sized establishments than small ones, and in the two instances (Chemicals and Iron and Steel) where large firms make proportionately less use of road haulage than medium size firms very large quantities are shipped by rail.

The general distribution of traffic is, therefore, that where small quantities are involved frequent use is made of transport on own account; as the quantities increase more use is made proportionately of road haulage, and where very large quantities are involved frequent use is made of rail.

With the exception of the Paper industry the overall expenditure per ton figures are of the order that one would expect, in Foodstuffs £3-0; Chemicals £1-5; Iron and Steel £1-1; Electronics £2-8; Paper £2-9.

Iron and Steel with its bulk shipments and low liability to damage has an expenditure per ton which is only one-third of that of Foodstuffs and Electronic Equipment, and expenditure per ton in the Chemical industry, where bulk shipping also occurs on a large scale but where special transport facilities are frequently required, is slightly higher. In Foodstuffs and Electronics where loadability is not so high as in the other two industries, and where special transport facilities are needed the expenditure per ton is correspondingly high. It is, however, surprising that the cost per ton of shipping Paper is so high as this is a commodity which has extremely good loadability and where there are possibilities of large shipments from mills. Calculations<sup>1</sup> which have been made for transport on own account operation from the 1962 Road Goods Survey and the 1963 Census of Production show, however, exactly the same ordering of expenditure per ton for these five industries; so that in the light of this, expenditure per ton in the Paper industry as shown by this survey is perhaps not unreasonably high.

Although in some instances there appeared to be an inverse relationship between the quantities shipped per establishment and expenditure this was by no means clear cut, the reason being that total quantity shipped and commodity are only two of many factors which influence payments made. Clearly such factors as consignment weight, length of haul, origin and destination, degree of competition, speed, type of rail service used, and regularity of shipments are also vital factors influencing the charge made and the simultaneous interaction of these and other factors is considered in the section below.

## Charges for consignments: the General Survey

In this section an attempt is made to isolate the influence of factors on the charge for transport services. As has already been mentioned in such an analysis the influence of all factors must be considered simultaneously and in order to do this use was made of multiple regression analysis. In the following paragraphs only a summary of the results has been given but detailed results and commentaries are contained in Appendix 3.

It must be stressed that these results only give an indication of the pattern of charges, they cannot be said to hold in any specific instance. This is especially the case when one considers broad groupings of such factors as commodities, origins and

destinations, and performance of ancillary services, for due to the heterogeneity of such groupings one is only obtaining a broad average result. It must also be pointed out that these figures pertain to a situation existing in the last quarter of 1966 and there may have been subsequent changes in the charging structure. In so far as this study only concerns manufacturing industry it only covers a very small part of bulk movement.

## Rail charges<sup>2</sup>

The factors considered in the analysis are:

Commodity; length of haul; consignment weight; regularity of shipment; region of origin; region of destination; annual tonnage shipped by rail; type of rail service used; container used; name displayed on wagon; special wagon required; method of collection; extra service performed by operator.

A variable raising is charges by alternative modes of transport, for charges are possibly influenced by the degrees of competition on particular routes; charges of alternatives were, of course, available from the shippers but in this instance it is what the operators think their competitors are charging which is the important factor and not what the shippers think the charges are. Degree of competition is, however, to some extent taken into account in the origin and destination variables. Unfortunately combinations of origins and destinations could not be included so that the analysis only considers the influence of a particular region of origin or destination and not a particular route and this would tend to lessen the importance of these variables (see Appendix 3).

The analysis showed that consignment weight was by far the most important factor determining the rail charge with an explanatory power of 89 per cent, i.e. it explained nine-tenths of the variance in charges. Use of passenger services was the second most important factor but was nevertheless of much less importance than consignment weight explaining only 4 per cent of the charges. The interesting feature about these results was that increasing distance had a relatively small influence on the charge—a doubling of the length of haul only increasing the charge by about one-fifth. Likewise there were clear economies in large shipments—a doubling of the size of consignment only increasing the charge by about three-quarters.<sup>3</sup>

Because of the special provisions needed for the carriage of electrical goods charges for these were, other factors considered, about 45 per cent above those for a 'neutral' good, i.e. a good that did not significantly influence the charge. Chemicals also incurred charges that were some 80 per cent above those for a neutral good. By contrast manufactured foodstuffs incurred charges that were, other factors considered, some five-ninths of those for a neutral good.<sup>4</sup>

There was no important difference between the charges for manufactured foodstuffs and raw foodstuffs, the former being shipped by the relatively inexpensive freight sundries and the latter by the very fast but correspondingly expensive passenger parcels service. The average nature of these findings must again be stressed here for whilst, over all commodities, consignments shipped by passenger train incurred, on average, charges that

<sup>1</sup> See also p. 121 for tabular presentation.

<sup>2</sup> Loadability is, of course, a vital factor but this is covered by commodity type to some degree.

<sup>3</sup> As consignment weight and total tonnage shipped by and during the year are highly correlated (zero-order correlation coefficient 0.84) it is not possible to separate out the influence of these two factors.

<sup>4</sup> The heterogeneity of the commodity groupings is apparent here for whilst in fact certain types of chemicals bear a 50 per cent surcharge because of their dangerous nature other non-dangerous types bear no surcharge.

were just over 90 per cent greater than the corresponding rates by freight train, the charges for consignments of less than 16 lbs are, in fact, less by passenger train than freight train. As consignment size increases over 16 lbs the greater becomes the proportionate difference between the two sets of rates.

The results showed a significant difference only between passenger and freight rates, it was not significant difference between the different types of freight service. The reason for this is because the analysis is confined to manufacturing industry and there are very few consignments of wagon or train load size covered by the survey (but see p. 121 for some tentative findings).

Consignments shipped in containers incurred charges, other factors considered, that were some 15 per cent higher than for non-containerised consignments. This does not, of course, include freight liner containers.

There was some evidence that, as a rule, there were no significant regional differences in rail rates. But due to the small number of regions considered and failure to take account of combinations of origin and destinations such evidence was not conclusive.

### Road haulage charges

The factors considered in the analysis are:

Commodity; length of haul; consignment weight; regularity of shipment; region of origin; region of destination; annual tonnage shipped by road haulier; consignment required more urgently than usual; container used; same displayed on vehicle; special body required; extra service performed by operator.

The analysis gave very similar results to that for rail charges—consignment weight was again by far the most significant variable determining the charge for road haulage with an explanatory power of 82 per cent, with length of haul the second but much less important factor (5 per cent). The analysis again illustrated the economies of large shipments with a doubling of consignment size only increasing the charge by some 60 per cent, and also the relative unimportance of distance with a doubling of distance only increasing the charge by about 30 per cent. In the case of road haulage charges the relationship between total tonnage shipped and consignment weight was not as great and it was possible to consider both in the analysis. Perhaps a little surprising the shipping of large annual tonnages did not of itself result in substantial reductions in rates—a doubling of annual tonnage sent by haulier resulting in a reduction of only about 5 per cent in the rate. Clearly hauliers are much more influenced by the size of individual consignments rather than annual tonnage generated.

The use of a container had exactly the same influence on the charge as was the case with rail, it is a 15 per cent increase, and where a special body was required this increased the charge on average by almost 90 per cent, other factors considered. Where the shipper's name or product was displayed on the vehicle charges were some 30 per cent higher than when this was not the case but this is probably more a function of contract hire than advertising.

There was some, but certainly not conclusive, evidence that road haulage rates varied, other things being equal, according to the importance of a region as a receiver or generator of traffic (see Appendix 3 for a full discussion of this point).

Manufactured foodstuffs showed exactly the same proportionate reduction of charges as was the case with rail, and iron scrap and building materials and materials which are bulk

commodities similarly faced charges which were only about three-fifths of those for a neutral good. The charges for the carriage of transport vehicles and equipment on the other hand were almost 90 per cent higher, other factors considered, than the charges for neutral goods. In contrast to rail the carriage of chemicals (acid and metal manufacturers higher charges than those for neutral goods but as was pointed out in the Introduction this could well result from the heterogeneity of the groupings, i.e. the goods carried by road and rail in these two categories could differ substantially).

### Conclusions

The analysis of charges for the shipment of consignments from manufacturing industry has shown that the longer the haul the cheaper rail becomes relative to road, other things being equal, and the larger the consignment the more expensive rail becomes relative to road other things being equal<sup>4</sup>. For any given weight of consignment, therefore, there must be a theoretical haul<sup>5</sup> at which rail charges fall below those of road. Assuming a neutral commodity and a 1 cwt consignment the relative charges of road and rail are shown in the graph below. The charge for any non-neutral commodity or when a factor such as the use of a container pertains is found by increasing the ones below by the appropriate proportions.

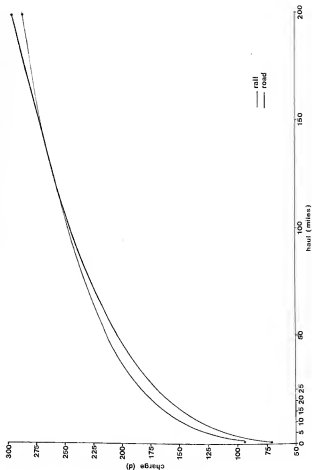
The pertinent cross-over point for 1 cwt consignments is approximately 125 miles: for smaller consignments, therefore, the cross-over point comes earlier and for larger consignments later—the road charge for a 5 ton consignment of a neutral commodity are, for instance, only 69 per cent of the rail charge even for a haul of 500 miles. The rail charge is, in fact, above the corresponding road charge for a neutral commodity for any feasible length of haul in this country for any consignment of 250 lbs or over. At the other end of the size scale, however, the rail and road charges are identical (47 pence) for the carriage of a 22 lb consignment for as little as 10 miles, and for all hauls in excess of this the rail charge is increasingly lower than the corresponding road charges.

This analysis of charges throws some interesting light on the question of the importance of price in modal choice. For any large consignment (250 lbs or above) in the survey of a neutral commodity the rail has a price disadvantage, any such traffic that it carries, therefore, is sent by rail for reasons other than price. Although the bulk of rail traffic in the Survey comprises consignments of less than 250 lbs, even in this group a substantial proportion of consignments are carried at a price disadvantage. For the very small consignment (22 lb) where rail has the greatest advantage and for the longest hauls (300 miles) the rail charge for a neutral commodity is 94 pence compared with a road charge of 118 pence so even here the rail price advantage is not great. And when one considers that well over half of rail consignments of manufactured goods are sent by passenger train and that this proportion is higher for small consignments (see Part III, Chapter 4), it can be seen that the higher charge for this service for consignments over 16 lbs will mean that the rail charge will often be in excess of the corresponding road charge.

<sup>4</sup> This result holds, of course, only for consignments up to a fairly limited size, i.e. only those consignments sizes covered by the survey.

<sup>5</sup> Theoretical because the haul might be so long as not to be realistic.

Graph 3 Road and Rail charge for a consignment of a neutral commodity weighing 1 cwt





Many rail consignments are carried, therefore, at a price disadvantage so this supports the evidence that was obtained on relative charges and which is discussed in Part II, Chapter 4. There are also clear areas of traffic going by road haulier where there is a price disadvantage vis-a-vis rail. About 10 per cent of road consignments are 22 lb or less yet eight-tenths of these are carried for distances of over 25 miles. Over one-half of road haulage consignments are over 22 lb but less than  $\frac{1}{2}$  ton and of these over one-half are shipped for distances in excess of 100 miles. Clearly many of the consignments of less than 22 lb and from 22 lb up to  $\frac{1}{2}$  ton could be sent more cheaply by rail yet manufacturers have preferred road for seasons other than price.

It can be concluded, therefore, that very substantial numbers of consignments are not sent by the cheapest mode.

#### Charges for consignments in selected industries

Budget constraints did not allow an analysis similar to that in the previous section to be carried out for each of the selected industries in the Commodity Survey. The previous analysis has shown, however, that consignment weight and length of haul accounted for most of the variance in charges and in the following paragraphs these two factors are considered with respect to each of the five industries.

It must again be stressed that as all factors are not being taken into account this analysis only demonstrates a general pattern of charges. The effects of all factors except those specifically mentioned have been averaged out in such an analysis and the figures do not hold, therefore, in any specific instance.

#### Foodstuffs

A comparison of charges in relation to size of consignment alone shows that the cost per lb of road haulage are in general, slightly below the corresponding rail rates (see graph 4 below)<sup>1</sup>. The graph also shows that in general the rates per lb decline with increases in consignment size thus demonstrating the economy of shipping in bulk. In terms of cost per lb/mile, however, the rail rates are below those for road haulage which means that consignments sent by rail travel for larger distances than those sent by road (see graph 5 below).

One would expect, ceteris paribus, that cost per lb would increase with distance but not necessarily by a constant amount. Because loading and unloading has only to occur once there are grounds for assuming that there will be a distance taper on rates. An examination of graph 6 below shows that although in general, rates for road haulage increase by a decreasing amount there is a very substantial degree of fluctuation in the rail rates. This fluctuation probably occurs because of the small number of observations for rail charges.

#### Chemicals

A very similar relationship exists in Chemicals to that experienced in Foodstuffs. Costs per lb decrease with size of consignment for both road and rail, and from a consignment size of about 3 tons there is no difference between the rail and road rates (see graph 8 below). In terms of cost per lb/mile, however, rail charges are below those of road haulage for all con-

signment sizes, indicating once more that rail consignments are carried for longer distances than road consignments (see graph 9 below).

Both road and rail charges increase with distance but rail charges are in general, above the road charges and rise much more steeply (see graph 10 below). Chemicals is one of the industries where use is made of coastal shipping and the ORO. As might have been expected the coastal shipping rates are well below those for rail and road even for consignments of less than 1 cwt. The ORO rates are interesting for the rates are uniform for all distances, thus the cost per lb figures are fairly constant for all lengths of haul, they remain, however, even for distances in excess of 300 miles well above the road and rail rates. The costs per lb/mile, however, decrease rapidly with distance, and whilst for very short hauls the cost is very expensive compared with road and rail its charges come much closer to rail over the longer distances, but nevertheless, never fall below them.

#### Iron and Steel

The transport charges for Iron and Steel form a contrast to Foodstuffs and Chemicals in that the rail and road rates are practically identical for all consignment sizes and all lengths of haul. The similarity of the cost per 100 lb/mile figures for the two modes indicates that the average length of haul in road haulage is similar to rail (see graphs 12 to 15 below).

#### Electronic equipment

Rates bear the same relationship to consignment size and length of haul that was characteristic of other industries, with the sharp fall in charges over the lower range of consignment size levelling out as size increases, and with cost per lb increasing with length of haul but by a reducing amount (see graphs 16 to 19 below).

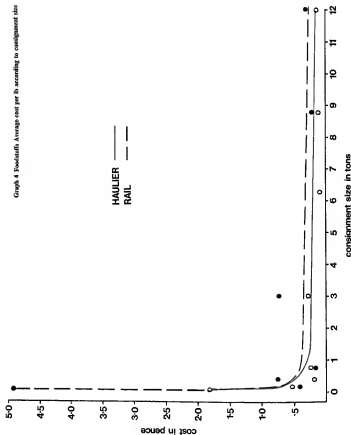
Electronic equipment is one of the industries where the ORO is used comparatively frequently and the same characteristics that were noted with respect to chemicals are again apparent here. The constancy of the rates resulting from average cost pricing with respect to distance is again demonstrated, as is the sharp fall in cost per lb/mile as distance increases. As was the case with chemicals, however, the rate per lb/mile never falls below that for road haulage or rail even for distances in excess of 300 miles.

#### Paper

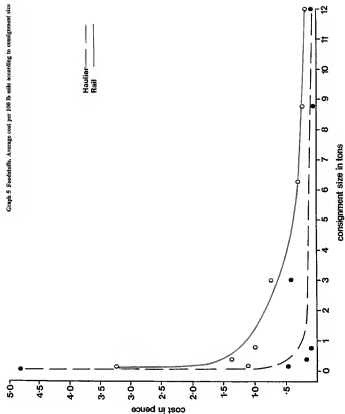
The features noted in other industries with respect to charges are also apparent in the case of Paper, and it is worth noting once again the great similarity between the road and rail rates,

<sup>1</sup>In this and the following graphs the observations are the means of groups, occasionally where the shortage of observations has resulted in large sampling errors a group mean has been omitted. The lines are free hand lines of best fit.

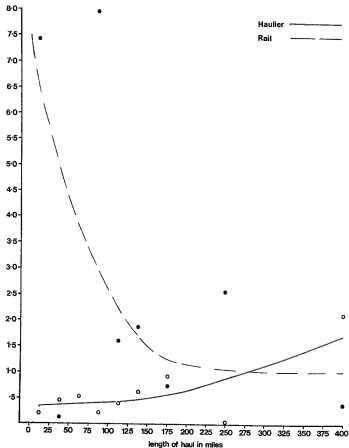
Graph 4 Foodstuffs Average cost per lb according to consignment size



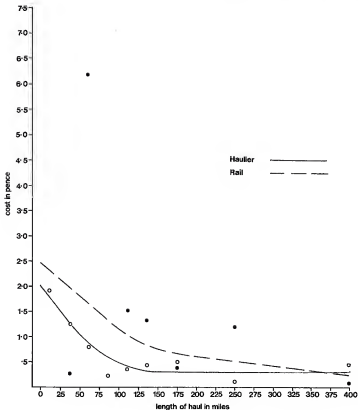
Graph 5 Feedstuffs. Average cost per 100 lb sold according to consignment size



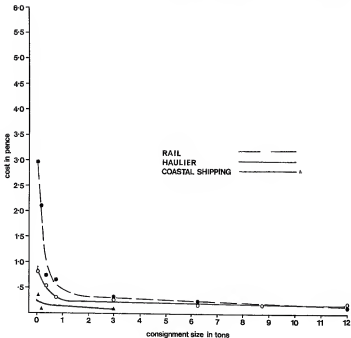
Graph 6 Foodstuffs. Average cost per lb according to length of haul



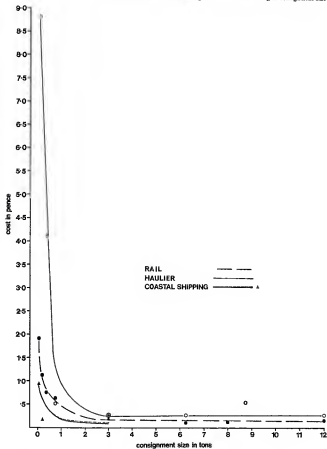
Graph 7 Foodstuffs. Average cost per 100 lb mile according to length of haul



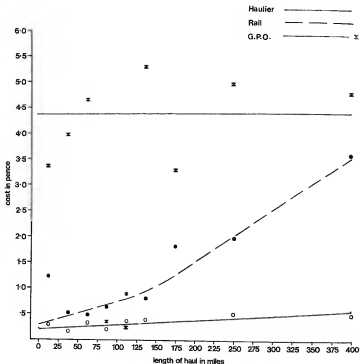
Graph 8 Chemicals—Average cost per lb according to consignment size



Graph 9 Chemicals—Average cost per 100 lb mile according to consignment size

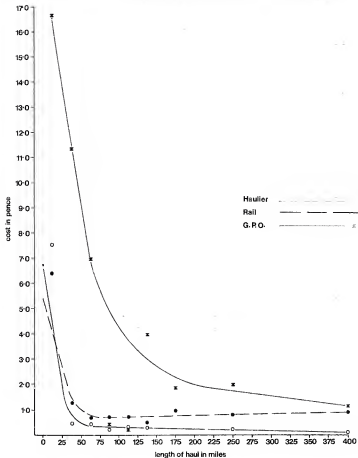


Graph 10 Chemicals—Average cost per lb according to length of haul

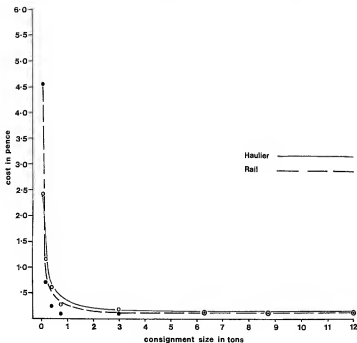




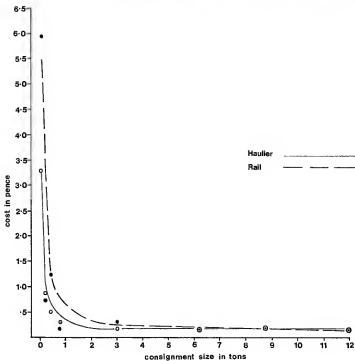
Graph 11 Chemicals—Average cost per 100 lb mile according to length of haul



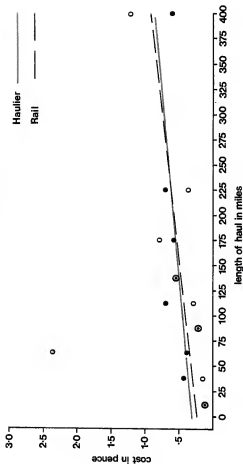
Graph 12 Iron and Steel—Average cost per lb according to consignment size

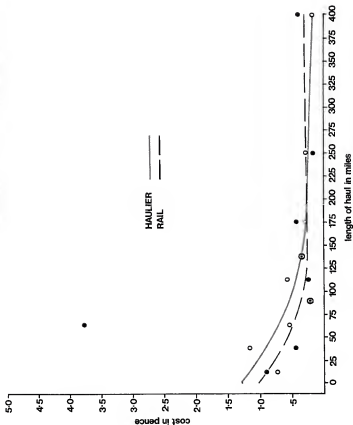


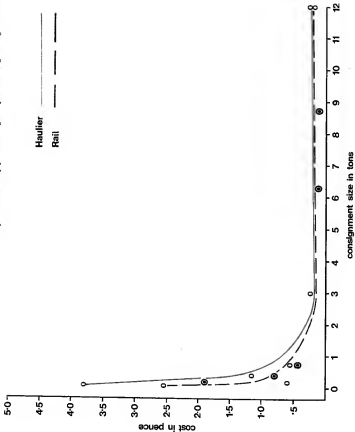
Graph 13 Iron and Steel—Average cost per 100 lb mile according to consignment size

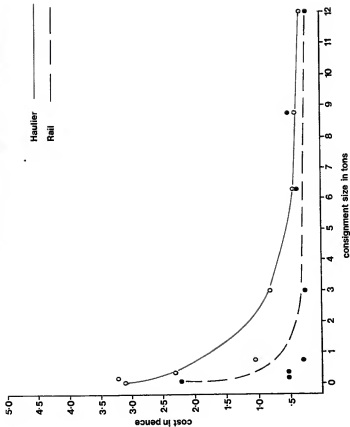


Graph 14 Iron and Steel—Average cost per lb according to length of haul

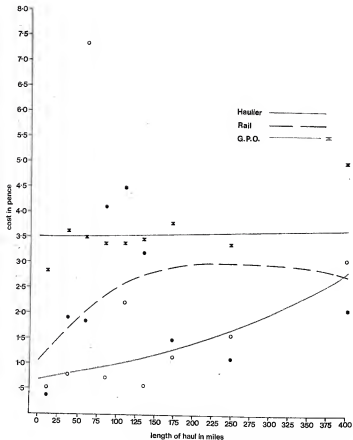






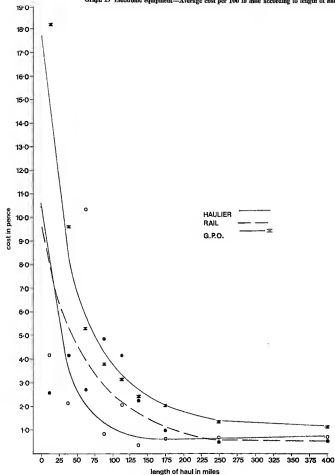


Graph 18 Electronic equipment—Average cost per lb according to length of haul

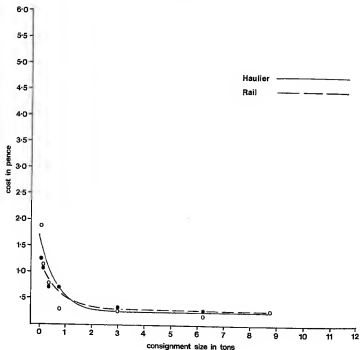




Graph 19 Electronic equipment—Average cost per 100 lb mile according to length of haul

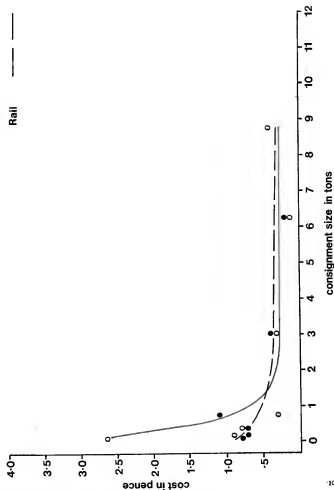


Graph 20 Paper—Average cost per lb according to consignment size

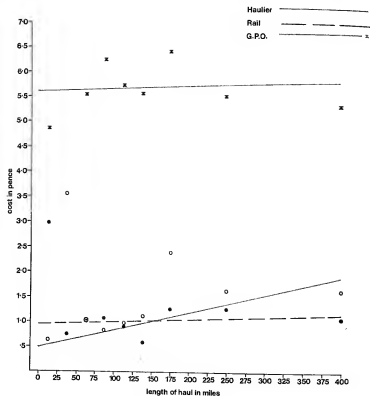


Haulier

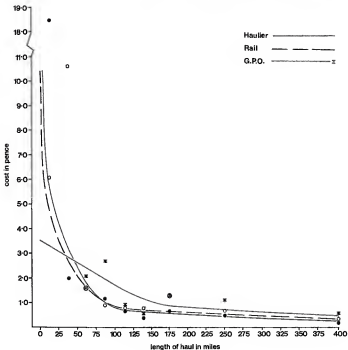
Rail



Graph 22 Paper—Average cost per lb according to length of haul



Graph 23 Paper—Average cost per 100 lb mile according to length of haul



## Ownership of Transport Facilities

This Chapter considers not only the transport facilities that are owned by the firm, eg vehicles, wagons, or private sidings, but also those that are under the control of the firm, eg A 'contract' vehicles or hired vehicles and wagons. Throughout the Chapter the General Survey which is unbiased with respect to industry has been used to demonstrate the influence of establishment size on ownership and use of transport facilities, whilst the Commodity Survey has been used to demonstrate the differences between industries. The Survey results show that by far the most common transport facility owned by a firm is a 'C' licence fleet, four-fifths of the firms in the General Survey owning such fleets. The vast majority of these fleets are, however, very small with two-thirds having a total unladen weight of less than 10 tons and with less than 5 per cent having a total unladen weight in excess of 100 tons (see Table below).

The proportion of large establishments (nine-tenths) owning 'C' licence fleets is greater than for small establishments (three-quarters) but not significantly greater than for medium establishments, and the size of large establishments fleets is (as is to be expected), also appreciably greater, with only one-third of the large establishment fleets being less than 10 tons compared with about three-quarters for small and medium sized establishments.

Actual size of the firm has an important bearing upon ownership and size of 'C' licence fleets, but nature of business also has some influence upon these two factors. In the Com-

modity Survey there was not a great deal of difference between the proportions of firms owning fleets in the different industries with Foodstuffs and Electronic equipment forming the two extremes at 92 per cent and Paper the other at 83 per cent.<sup>1</sup>

In the General Survey, however, the difference between the two extreme groups Foodstuffs (90 per cent) and Clothing and Footwear (73 per cent) was greater, and although, in general, one must be careful in drawing conclusions about nature of business from the General Survey, the number of observations (116) for Clothing and Footwear is so high as to enable conclusions to be drawn in this instance. The influence of nature of business upon the size of fleet is very apparent (see Table below) with three-quarters of the establishments in the Electronic equipment industry owning fleets of less than ten tons unladen weight compared with only about one-third in Chemicals and Foodstuffs even though the size of firms in the sample is greater in Electronic equipment than in Chemicals<sup>2</sup> and very much greater than in Foodstuffs.

<sup>1</sup> Chemicals 84 per cent; Iron and Steel 85 per cent.

<sup>2</sup> Distribution of establishments according to size.

|                      | Over 499 | 100-499 | Under 100 |
|----------------------|----------|---------|-----------|
| Electronic equipment | 32%      | 57%     | 11%       |
| Foodstuffs           | 11%      | 55%     | 34%       |
| Chemicals            | 34%      | 47%     | 20%       |

Table 101: Size of 'C' licence fleets according to size of establishment

| Size (employees) | Total unladen weight (tons) |       |       |        |         |         |         |         |          | Total establishments |
|------------------|-----------------------------|-------|-------|--------|---------|---------|---------|---------|----------|----------------------|
|                  | under 10                    | 10-25 | 25-50 | 51-100 | 101-200 | 201-300 | 301-400 | 401-500 | Over 500 |                      |
| Over 499         | 19                          | 15    | 7     | 4      | 5       | 2       | —       | —       | —        | 52                   |
| per cent         | 36                          | 28    | 13    | 8      | 10      | 4       | —       | —       | —        | 300                  |
| 100-499          | 104                         | 23    | 10    | 8      | 3       | —       | —       | —       | 1        | 149                  |
| per cent         | 70                          | 15    | 7     | 5      | 2       | —       | —       | —       | 1        | 100                  |
| Under 100        | 76                          | 10    | 3     | 1      | 1       | —       | —       | —       | —        | 91                   |
| per cent         | 84                          | 11    | 3     | 1      | 1       | —       | —       | —       | —        | 100                  |
| Not known        | 1                           | 3     | —     | —      | —       | —       | —       | 1       | —        | 5                    |
| per cent         | 20                          | 60    | —     | —      | —       | —       | —       | 20      | —        | 100                  |
| Total            | 200                         | 51    | 20    | 13     | 9       | 2       | —       | 1       | 1        | 297                  |
| per cent         | 67                          | 17    | 7     | 4      | 3       | 1       | —       | 1       | 1        | 100                  |

Source: General Survey

In the Foodstuffs industry the size of fleets is very large in comparison with the size of the establishments, which suggests that where a fleet is owned (and this occurs in nine-tenths of the cases) it tends to be by far the most important form of transport used by a firm (see Table 57 p. 63). In Electronic equipment however, the small size of the fleets and the large size of the establishments suggests that little use is made of transport on own account even though nine-tenths of establishments own fleets. An examination of Table 57 p. 63 shows, however, that transport on own account is the most important mode used in this industry. The explanation lies in the fact that the actual amounts shipped per establishment are very much lower in Electronic equipment than in other industries, the average annual tonnage shipped by large firms being only one-sixth of that by large firms in Foodstuffs (see pp. 82 and 85).

#### 'C' vehicle pools and 'C' hiring arrangements

A close substitute to owning vehicles is the use of 'C' licence pools or 'C' hiring arrangements'. Where there is a group organisation 'C' pools sometimes exist with each establishment in the group drawing on a common pool. The advantages that accrue from this are two-fold; firstly, the capacity is more fully utilised, secondly, there are economies of large scale operation (see Chapter 8, Part II and Chapter 2, Part III). Although group organisations occurred frequently in both Surveys (53 per cent of establishments in the General Survey and 70 per cent in the Commodity Survey belonged to groups (see pp. 64), only about one-twentieth of the establishments in the two Surveys had access to 'C' licence pools. Pools occurred with a slightly greater frequency in small establishments (5 per cent) than in medium (2 per cent) and large (3½ per cent) in the General Survey, but with so few observations no conclusions can be drawn about the influence of size. There is some indication that nature of business has an influence upon use of pools, their frequency being three times as great in Chemicals as in Electronic equipment in the Commodity Survey. Again it is difficult

to draw conclusions with so few observations, but possibly the need for specialised vehicles in some industries results in a greater tendency to use pooled fleets.

Twenty eight (8 per cent) establishments in the Commodity Survey and twenty three (6 per cent) in the General Survey had 'C' hiring arrangements, and although over three-quarters of these also owned 'C' licence vehicles the size of hired fleets was broadly similar to that of fleets that were owned—four-fifths of the hired and owned fleets in the General Survey having a total unladen weight of 25 tons or less. However, the proportion of hired fleets of less than 10 tons (one-third) is only half that for fleets that are owned. The relatively high proportion of large hired fleets is explained by the fact that 'C' hiring occurs proportionately with double the frequency in large firms than in medium and small ones, whereas for owning the respective ratios are 9:9:7. Hiring of vehicles, as with owning, occurs most frequently in Foodstuffs and Electronics with one-tenth of establishments in these industries having hiring facilities compared with about one-twentieth of the establishments in the other three industries.

#### 'B' licence vehicles

Only 4 establishments in the General Survey owned 'B' licence vehicles which can be used both for the carriage of one's own goods and for hire or reward. This was exactly one-quarter of the number of establishments with these facilities in the Commodity Survey. In the General Survey three of these fleets were in excess of 500 tons, but with such small numbers this gives no indication of the general rule, indeed in the Commodity Survey over one-half of the fleets were under 10 tons. Nature of business seems to influence the ownership of 'B' licence fleets for one-tenth of the establishments in the Chemical industry had such fleets compared with none in foodstuffs and one-twentieth in the other industries covered by the Commodity Survey. Certainly specialisation of vehicles is not the answer to this for both Chemicals and Foodstuffs have a high proportion of specialised vehicles, the answer probably results from the fact that in Foodstuffs journeys are frequently local deliveries with many intermediate stops so that it would probably be a disadvantage *con-wise* to have to carry other people's goods, whereas in the Chemicals industry the hauls are frequently long and therefore carriages for hire or reward could result in a better use of capacity.

\* 'C' hiring present a problem of definition; it usually refers to a shipper who hires vehicles and operates them himself, but this occasion has been used by certain hauliers to overcome haulage restrictions and to carry on business as professional operators (see European Transport by Brian T. Boyle pp. 80-81). It is impossible to distinguish in the analysis between these two.

Table 192: Size of 'C' licence fleets according to selected industries

| Nature of Business | Total unladen weight (tons) |       |       |        |         |         |         |         |          | Total establishments |
|--------------------|-----------------------------|-------|-------|--------|---------|---------|---------|---------|----------|----------------------|
|                    | Under 10                    | 10-25 | 25-50 | 51-100 | 101-200 | 201-300 | 301-400 | 401-500 | Over 500 |                      |
| Foodstuffs         | 29                          | 23    | 6     | 9      | 2       | —       | —       | —       | —        | 49                   |
| per cent           | 59                          | 11    | 16    | 18     | 4       | —       | —       | —       | —        | 100                  |
| Chemicals          | 18                          | 7     | 16    | 4      | 8       | —       | 1       | —       | 2        | 56                   |
| per cent           | 32                          | 12    | 29    | 7      | 14      | —       | 2       | —       | 4        | 100                  |
| Iron & Steel       | 30                          | 6     | 7     | 2      | 2       | 2       | 1       | —       | 1        | 65                   |
| per cent           | 44                          | 18    | 15    | 11     | 4       | 4       | 2       | —       | 2        | 100                  |
| Electronic equip-  |                             |       |       |        |         |         |         |         |          |                      |
| ment               | 50                          | 11    | 4     | 1      | 2       | —       | —       | —       | —        | 68                   |
| per cent           | 74                          | 16    | 6     | 1      | 3       | —       | —       | —       | —        | 100                  |
| Paper              | 47                          | 21    | 13    | 10     | 1       | 1       | —       | —       | —        | 81                   |
| per cent           | 50                          | 23    | 14    | 11     | 1       | 1       | —       | —       | —        | 100                  |

Source: Commodity Survey

The small number of 'B' licence fleets in the two Surveys compared with the total in the country is explained by the fact that a large proportion of such fleets are used solely for carriage for hire or reward and are not owned by trading concerns. In other words the 'B' licence has become a public carriers licence subject to very stringent conditions.<sup>3</sup>

#### 'A Contract' vehicles

'A contract' fleets<sup>4</sup> are by far the most common alternative to owning vehicles, with 13 per cent of establishments in the General Survey and 23 per cent in the Commodity Survey

having such contracts. 'Alternative' is perhaps not the correct word for shippers rarely rely upon 'A contract' operation to the complete exclusion of owning 'C' licence vehicles; indeed three-quarters of the shippers in the General Survey with contracts and nine-tenths in the Commodity Survey also owned 'C' licence fleets. There is a much heavier concentration of 'A contract' fleets in the large firms than is the case with 'C' licence fleets, with contracts occurring with four times the frequency in large firms compared with small in the General Survey.<sup>5</sup> This concentration amongst the large firms accounts for the high proportion of relatively large 'A contract' fleets with less than one-half under 10 tons and nearly one-fifth over 50 tons (see Table below).

<sup>3</sup> For a full discussion of the conditions attached to licences see The Economics of Freight Transport by Brian T. Baylis to be published.

<sup>4</sup> 'A contract' vehicles are operated by professional hauliers for hire or reward but must be under contract to a customer for at least one year.

<sup>5</sup> 23 per cent of the large establishments had contracts compared with 14 per cent and 6 per cent for medium and small establishments respectively.

Table 103: Size of 'A Contract' fleets according to size of establishment

| Size of Firm (Employees) | Total vehicles weight (tons) |       |       |        |         |         |         |         |          |           | Total number of establishments |
|--------------------------|------------------------------|-------|-------|--------|---------|---------|---------|---------|----------|-----------|--------------------------------|
|                          | Under 10                     | 10-25 | 26-50 | 51-100 | 101-200 | 201-300 | 301-400 | 401-500 | Over 500 | Not known |                                |
| Over 499                 | 3                            | 3     | 4     | —      | 1       | —       | 1       | —       | —        | 1         | 13                             |
| per cent                 | 25                           | 25    | 34    | —      | 8       | —       | 8       | —       | —        | 8         | 108                            |
| 100-499                  | 11                           | 3     | 5     | 4      | 1       | —       | —       | —       | —        | —         | 26                             |
| per cent                 | 46                           | 12    | 21    | 17     | 4       | —       | —       | —       | —        | —         | 100                            |
| Under 100                | 3                            | —     | 2     | —      | —       | —       | —       | —       | —        | 3         | 7                              |
| per cent                 | 60                           | —     | 40    | —      | —       | —       | —       | —       | —        | 40        | 140                            |
| Not known                | 1                            | —     | —     | —      | —       | —       | —       | —       | —        | —         | 1                              |
| per cent                 | 100                          | —     | —     | —      | —       | —       | —       | —       | —        | —         | 100                            |
| Total                    | 18                           | 6     | 11    | 4      | 2       | —       | 1       | —       | —        | 3         | 45                             |
| per cent                 | 43                           | 14    | 26    | 10     | 5       | —       | 2       | —       | —        | 7         | 107                            |

Note: %'s are based upon known tonnages.

Source: General Survey

Table 104: Size of 'A Contract' fleets in selected industries

| Nature of Business   | Total vehicles weight (tons) |       |       |        |         |         |         |         |          |           | Total number of establishments |
|----------------------|------------------------------|-------|-------|--------|---------|---------|---------|---------|----------|-----------|--------------------------------|
|                      | Under 10                     | 10-25 | 26-50 | 51-100 | 101-200 | 201-300 | 301-400 | 401-500 | Over 500 | Not known |                                |
| Foodstuffs           | 5                            | 3     | 6     | —      | 1       | —       | —       | —       | —        | —         | 15                             |
| per cent             | 33                           | 20    | 40    | —      | 7       | —       | —       | —       | —        | —         | 106                            |
| Chemicals            | 2                            | 3     | 5     | 3      | 3       | 2       | —       | —       | 2        | —         | 23                             |
| per cent             | 9                            | 23    | 23    | 14     | 13      | 9       | —       | —       | 9        | —         | 100                            |
| Iron and Steel       | —                            | 6     | 3     | 2      | 4       | 4       | —       | 1       | —        | —         | 26                             |
| per cent             | —                            | 30    | 15    | 10     | 20      | 20      | —       | 5       | —        | —         | 106                            |
| Electronic equipment | —                            | 2     | 1     | —      | —       | —       | —       | —       | —        | —         | 3                              |
| per cent             | —                            | —     | —     | —      | —       | —       | —       | —       | —        | —         | —                              |
| Paper                | 7                            | 2     | 5     | 2      | 3       | —       | —       | —       | —        | 3         | 23                             |
| per cent             | 37                           | 11    | 26    | 13     | 15      | —       | —       | —       | —        | 15        | 115                            |

Note: percentages are based upon known tonnages.

Source: Commodity Survey



The incidence of 'A contract' fleets in the Commodity Survey suggests that Nature of Business as well as size of establishment has an important influence upon such contracts for half of the establishments in the Chemicals and Iron and Steel industries had contracts compared with one-quarter in Paper and one-twentyfifth in Electronic equipment.<sup>1</sup>

Nature of business besides influencing the existence of contracts also has an important effect upon the size of 'A contract' fleets. Only about one-tenth of the fleets in the Chemicals industry are less than 10 tons and none in Iron and Steel is this small whilst about one-third of the fleets in Foodstuffs and Paper are below 10 tons. At the other end of the scale in the region of one-half of the fleets in the Chemicals and Iron and Steel industries are over 50 tons whilst only one-quarter in the Paper industry is of this size and only one-tenth in Foodstuffs (see Table 104). One would, of course, expect this because of the larger firms in Chemicals and Iron and Steel but this would not account for a difference of anywhere near this extent.

'A contract' operation occurs in large firms and those industries where there are substantial flows of traffic, hence its predominance in Chemicals and Iron and Steel and its infrequency in Electronic equipment where flows are very small in terms of weight (see p. 39). This is, however, not a total explanation of the causal factors, for it could be argued that so long as the flows are large enough to fully utilize the capacity of one vehicle the size of flows over this minimum level would hardly appear relevant to the decision to use an 'A contract' vehicle. The answer to the problem probably lies in the possibility of obtaining incoming traffic for the contract shippers. If the shipper serves a large market and has substantial flows of outgoing and incoming traffic then there is a good chance of arranging for return loads; both the markets and the flows in the Chemical and Iron and Steel industries are large and a great deal of return traffic is obtained. Where incoming traffic can be collected the cost and service of 'A contract' operation could possibly be superior to that of open 'A' licence operation.

#### Size and types of vehicles

So far the analysis has been concerned with the total size of the fleets and in this section the composition of fleets with respect to size and type of vehicles is considered.

The argument has been advanced<sup>2</sup> that vehicle mix is one of the important economies in large scale operations; this implies, broadly, that large operators can choose the vehicles best suited to particular hauls, eg small vehicles in urban areas and large vehicles for trunk hauls, whilst small operators have to choose an intermediate vehicle which is suitable for both but ideal for neither. An investigation<sup>3</sup> of Operator's Costs in Road Freight Transport showed this to be the case for public carriers but an examination of the Tables below shows that in its own account operation vehicle mix is determined more by the nature of business than the size of the firm. In the General Survey one-half of the vehicles belonging to large firms were under 2 tons whilst one-quarter were over 5 tons and the respective proportions for small firms were almost identical. In the Commodity Survey, by contrast, there was a strong tendency for large firms to have a higher proportion of large vehicles than small and

this was particularly noticeable in Chemicals and Iron and Steel (see Table below). In both industries about 60 per cent of the vehicles belonging to large firms were over 5 tons whilst the proportion for small firms was less than 10 per cent. In Electronics, however, 60 per cent of the large firms' vehicles were under 2 tons. It is the case, therefore, that where there are very large flows of heavy traffic such as in Chemicals and Iron and Steel large vehicles can be used with their intrinsic economy of operation, whilst where the flows are light such as in Electronic equipment (see p. 39) the majority of the vehicles is also small. The failure for this pattern to appear in the General Survey is to some extent explained by the fact that because a firm is large this does not mean that the flows are large as is demonstrated in the case of Electronic equipment.

Table 105: Fleets analysed by size of vehicles

|               |                       | Number of vehicles |                                   |         |          |           |       |
|---------------|-----------------------|--------------------|-----------------------------------|---------|----------|-----------|-------|
| Licence Class | Unladen weight (tons) |                    | Size of Establishment (Employees) |         |          |           | Total |
|               | Over                  | Not over           | Under 100                         | 100-499 | Over 499 | Not known |       |
| 'C'           | 2                     | 2                  | 109                               | 300     | 426      | 6         | 842   |
|               | 2                     | 3                  | 34                                | 91      | 43       | 21        | 179   |
|               | 3                     | 5                  | 26                                | 166     | 115      | 64        | 391   |
|               | 5                     | 8                  | 21                                | 129     | 96       | 16        | 343   |
|               | 8                     |                    | 26                                | 15      | 54       | 5         | 100   |
|               | Total                 |                    | 207                               | 702     | 736      | 112       | 1757  |
| 'B'           | 2                     | 2                  | —                                 | 10      | —        | —         | 10    |
|               | 2                     | 3                  | —                                 | 2       | —        | —         | 2     |
|               | 3                     | 5                  | —                                 | —       | —        | —         | —     |
|               | 5                     | 8                  | —                                 | —       | —        | —         | —     |
|               | 8                     |                    | —                                 | —       | —        | —         | —     |
|               | Total                 |                    | —                                 | 12      | —        | —         | 12    |
| 'A Contract'  | 2                     | 2                  | —                                 | 5       | 2        | —         | 7     |
|               | 2                     | 3                  | 1                                 | 4       | 4        | 3         | 12    |
|               | 3                     | 5                  | —                                 | 61      | 22       | —         | 83    |
|               | 5                     | 8                  | 2                                 | 57      | 34       | —         | 93    |
|               | 8                     |                    | 10                                | 26      | 43       | —         | 79    |
|               | Total                 |                    | 13                                | 138     | 106      | 3         | 259   |
| 'C' hire      | 2                     | 2                  | 1                                 | 3       | 1        | —         | 5     |
|               | 2                     | 3                  | 1                                 | —       | —        | —         | 2     |
|               | 3                     | 5                  | 4                                 | 6       | 39       | —         | 50    |
|               | 5                     | 8                  | 2                                 | 6       | 2        | —         | 10    |
|               | 8                     |                    | 5                                 | 1       | —        | —         | 6     |
|               | Total                 |                    | 13                                | 16      | 43       | —         | 72    |
| All Classes   | 2                     | 2                  | 111                               | 318     | 429      | 6         | 864   |
|               | 2                     | 3                  | 26                                | 97      | 47       | 24        | 194   |
|               | 3                     | 5                  | 30                                | 255     | 146      | 64        | 479   |
|               | 5                     | 8                  | 25                                | 173     | 134      | 16        | 348   |
|               | 8                     |                    | 41                                | 40      | 99       | 5         | 185   |
|               | Total                 |                    | 213                               | 881     | 855      | 115       | 2664  |

Source: General Survey

<sup>1</sup> The proportion of establishments with contracts in the Commodity Survey was: Foodstuffs 39 per cent; Chemicals 49 per cent; Iron and Steel 99 per cent; Electronic equipment 4 per cent; Paper 26 per cent.

<sup>2</sup> By Gilbert Walker in *Road and Rail*, p. 172.

<sup>3</sup> Undertaken for the Directorate of Statistics of the Ministry of Transport by S. L. Edwards and R. T. Raylin. To be published by soon.

Table 106: Fleets analysed by size of vehicles

| Nature of Business   |           | C            |          |          |          |             |       |                |          |          |          | License     |       |              |          |
|----------------------|-----------|--------------|----------|----------|----------|-------------|-------|----------------|----------|----------|----------|-------------|-------|--------------|----------|
|                      |           | C            |          |          |          |             |       | D <sup>a</sup> |          |          |          |             |       |              |          |
|                      |           | Under 2 tons | 2-3 tons | 3-5 tons | 5-8 tons | Over 8 tons | Total | Under 2 tons   | 2-3 tons | 3-5 tons | 5-8 tons | Over 8 tons | Total | Under 2 tons | 2-3 tons |
| Foodstuffs           | Over 499  | 31           | 26       | 10       | 13       | 3           | 83    | —              | —        | —        | —        | —           | —     | —            | 5        |
|                      | 100-499   | 160          | 63       | 101      | 36       | 9           | 369   | —              | —        | —        | —        | —           | —     | 1            | 8        |
|                      | Under 100 | 39           | 17       | 23       | 10       | —           | 89    | —              | —        | —        | —        | —           | —     | 6            | 5        |
|                      | Not known | —            | —        | —        | —        | —           | —     | —              | —        | —        | —        | —           | —     | —            | —        |
|                      | Total     | 230          | 106      | 134      | 59       | 12          | 541   | —              | —        | —        | —        | —           | —     | 7            | 18       |
| Chemicals            | Over 499  | 123          | 23       | 61       | 108      | 235         | 540   | —              | —        | —        | 1        | 3           | 3     | 4            | —        |
|                      | 100-499   | 38           | 12       | 44       | 86       | 76          | 244   | —              | 1        | —        | —        | 1           | 2     | —            | —        |
|                      | Under 100 | 31           | 8        | 11       | 15       | 4           | 69    | —              | —        | 1        | 2        | —           | 3     | —            | 1        |
|                      | Not known | —            | 1        | 2        | 1        | 3           | 7     | —              | —        | —        | —        | —           | —     | —            | —        |
|                      | Total     | 189          | 43       | 118      | 203      | 319         | 863   | —              | 1        | 1        | 3        | 4           | 8     | 4            | 1        |
| Iron & steel         | Over 499  | 52           | 24       | 68       | 33       | 183         | 360   | —              | 2        | 1        | 1        | 3           | 7     | 1            | 3        |
|                      | 100-499   | 44           | 9        | 39       | 31       | 6           | 129   | 1              | —        | —        | —        | 3           | 6     | —            | —        |
|                      | Under 100 | 15           | —        | 7        | 1        | 3           | 26    | —              | —        | —        | —        | —           | —     | —            | —        |
|                      | Not known | 93           | 6        | 40       | 5        | 1           | 145   | —              | —        | —        | —        | —           | —     | —            | —        |
|                      | Total     | 204          | 39       | 154      | 70       | 193         | 660   | 1              | 2        | 1        | 1        | 6           | 13    | 1            | 3        |
| Electronic equipment | Over 499  | 82           | 5        | 9        | 4        | 5           | 109   | —              | —        | —        | —        | —           | —     | 5            | 2        |
|                      | 100-499   | 136          | 11       | 10       | 13       | —           | 170   | 14             | —        | 1        | —        | —           | 15    | —            | —        |
|                      | Under 100 | 5            | —        | —        | —        | —           | 5     | —              | —        | —        | —        | —           | —     | —            | —        |
|                      | Not known | 3            | 3        | —        | —        | —           | 6     | —              | —        | —        | —        | —           | —     | —            | —        |
|                      | Total     | 226          | 19       | 29       | 21       | 5           | 290   | 14             | —        | 1        | —        | —           | 15    | 5            | 2        |
| Paper                | Over 499  | 93           | 9        | 43       | 45       | 14          | 204   | —              | —        | 10       | —        | —           | 10    | —            | 1        |
|                      | 100-499   | 30           | 38       | 105      | 72       | 15          | 260   | —              | —        | 5        | —        | —           | 5     | 1            | 1        |
|                      | Under 100 | 29           | 3        | 16       | 9        | 5           | 62    | 3              | 1        | —        | —        | 2           | 6     | 1            | —        |
|                      | Not known | 1            | —        | 2        | —        | —           | 3     | —              | —        | —        | —        | —           | —     | —            | —        |
|                      | Total     | 173          | 50       | 166      | 126      | 34          | 569   | 3              | 1        | 15       | —        | 2           | 21    | 2            | 2        |
| Total                | Over 499  | 379          | 86       | 191      | 300      | 443         | 1,299 | —              | 2        | 11       | 2        | 5           | 20    | 10           | 11       |
|                      | 100-499   | 418          | 132      | 289      | 238      | 104         | 1,162 | 15             | 1        | 6        | —        | 6           | 28    | 2            | 9        |
|                      | Under 100 | 119          | 25       | 57       | 35       | 12          | 251   | 3              | 1        | 1        | 2        | 2           | 9     | 7            | 6        |
|                      | Not known | 97           | 10       | 44       | 6        | 4           | 161   | —              | —        | —        | —        | —           | —     | —            | —        |
|                      | Total     | 1,013        | 257      | 581      | 679      | 563         | 2,903 | 18             | 4        | 18       | 4        | 13          | 57    | 19           | 26       |

Source: Commodity Survey

The relatively large number of 'A contract' vehicles in both Surveys, and especially in the Commodity Survey, in comparison with national figures<sup>a</sup> results from the size bias in the Surveys and the predominance of 'A contract' operations in large firms. The difference between average vehicle holding in the two Surveys is, as previously discussed, due to the industry bias in the Commodity Survey; the average vehicle holding in the Clothing and Footwear industry which accounts for one-third of the establishments in the General Survey was only 2 compared with an average vehicle holding in the Commodity Survey of 11.

<sup>a</sup> The ratio in 1963 of 'C' license to 'A Contract' vehicles was 100:1.

| class        |          |             |       |              |          |          |          |             |       |              |          |          |          |             |       |
|--------------|----------|-------------|-------|--------------|----------|----------|----------|-------------|-------|--------------|----------|----------|----------|-------------|-------|
| 'A contract' |          |             |       |              |          |          |          |             |       | 'C' Hire     |          |          |          |             |       |
|              |          |             |       |              |          |          |          |             |       | All classes  |          |          |          |             |       |
| 3-5 tons     | 5-8 tons | Over 8 tons | Total | Under 2 tons | 2-3 tons | 3-5 tons | 5-8 tons | Over 8 tons | Total | Under 2 tons | 2-3 tons | 3-5 tons | 5-8 tons | Over 8 tons | Total |
| 29           | 12       | —           | 46    | —            | —        | 1        | —        | —           | 1     | 31           | 31       | 40       | 25       | 3           | 130   |
| 10           | 8        | 8           | 26    | 1            | 2        | 4        | —        | 1           | 8     | 162          | 79       | 115      | 45       | 18          | 413   |
| —            | 6        | 4           | 21    | —            | —        | —        | —        | —           | —     | 45           | 22       | 23       | 16       | 4           | 110   |
| —            | —        | —           | —     | —            | —        | —        | —        | —           | —     | —            | —        | —        | —        | —           | —     |
| 19           | 27       | 12          | 303   | 1            | 2        | 3        | —        | 1           | 9     | 235          | 126      | 178      | 86       | 25          | 639   |
| 5            | 10       | 96          | 117   | 1            | —        | —        | —        | 102         | 108   | 135          | 22       | 65       | 113      | 449         | 766   |
| 6            | 11       | 8           | 25    | —            | —        | —        | —        | —           | —     | 38           | 13       | 50       | 97       | 83          | 271   |
| —            | 2        | 2           | 8     | —            | —        | —        | —        | —           | —     | 31           | 9        | 12       | 23       | 6           | 80    |
| —            | —        | —           | —     | —            | —        | —        | —        | —           | —     | —            | 1        | 2        | 1        | 3           | 7     |
| 11           | 26       | 108         | 130   | 1            | —        | —        | —        | 103         | 109   | 185          | 45       | 130      | 203      | 532         | 1,124 |
| 18           | 31       | 178         | 233   | —            | —        | —        | —        | —           | —     | 53           | 29       | 57       | 63       | 364         | 588   |
| 7            | 9        | 26          | 42    | —            | —        | 1        | —        | —           | 1     | 45           | 9        | 47       | 40       | 37          | 178   |
| 28           | 13       | —           | 48    | —            | —        | —        | —        | 3           | 3     | 25           | —        | 55       | 14       | 6           | 70    |
| —            | —        | —           | —     | —            | —        | —        | —        | —           | —     | 59           | 6        | 40       | 5        | 1           | 145   |
| 53           | 33       | 394         | 314   | —            | —        | 1        | —        | 3           | 4     | 266          | 44       | 239      | 124      | 408         | 991   |
| 4            | 3        | —           | 13    | 3            | 1        | —        | 15       | 3           | 23    | 50           | 8        | 13       | 23       | 8           | 144   |
| —            | —        | —           | —     | —            | —        | —        | —        | —           | —     | 150          | 11       | 11       | 13       | —           | 182   |
| —            | —        | —           | —     | —            | —        | —        | —        | —           | —     | 3            | —        | —        | —        | —           | 5     |
| —            | —        | —           | —     | 1            | 3        | —        | —        | —           | 4     | 4            | 6        | —        | —        | —           | 10    |
| 4            | 2        | —           | 13    | 6            | 4        | —        | 15       | 3           | 25    | 349          | 23       | 24       | 38       | 8           | 344   |
| 12           | 9        | 66          | 106   | —            | —        | —        | 3        | —           | 5     | 93           | 16       | 85       | 29       | 80          | 327   |
| 3            | 3        | 20          | 28    | —            | —        | 1        | 2        | —           | 3     | 51           | 39       | 114      | 77       | 33          | 314   |
| 4            | 1        | 6           | 12    | —            | —        | —        | —        | —           | —     | 33           | 4        | 20       | 10       | 13          | 89    |
| —            | —        | —           | —     | —            | —        | —        | —        | —           | —     | 1            | —        | 2        | —        | —           | 3     |
| 18           | 13       | 93          | 143   | —            | —        | 1        | 7        | —           | 8     | 176          | 53       | 221      | 146      | 125         | 728   |
| 88           | 64       | 342         | 515   | 4            | 1        | 1        | 20       | 105         | 131   | 389          | 100      | 291      | 286      | 895         | 1,969 |
| 26           | 12       | 62          | 121   | 1            | 2        | 6        | 2        | 1           | 12    | 495          | 145      | 337      | 273      | 173         | 1,363 |
| 12           | 25       | 12          | 53    | —            | —        | —        | —        | 3           | 3     | 129          | 25       | 90       | 63       | 29          | 245   |
| —            | —        | —           | —     | 1            | 3        | —        | —        | —           | 4     | 90           | 13       | 44       | 6        | 4           | 163   |
| 146          | 121      | 415         | 728   | 6            | 6        | 7        | 32       | 109         | 150   | 1,015        | 283      | 762      | 626      | 1,101       | 3,886 |

### Vehicle body types

As regards types of vehicles, platform and boxbody vehicles account for over four-fifths of all body types of 'C' hire and 'A contract' vehicles in the General Survey, but whereas over one-half of the 'C' and 'C' hire vehicles are boxbody a similar proportion of 'A contract' vehicles is platform (see Table below). This is not dissimilar to the findings of the 1962 Road Goods Transport Survey but the two surveys are not strictly comparable as the exclusion of extractive and construction industries from the General Survey results in a very small proportion of tippers in comparison with the 1962 Survey. Certain business classes are more important in some body type groupings than others, thus nine-tenths of boxbody vehicles with special fittings are 'C' hire vehicles as shippers can adapt their own vehicles to their particular needs. 'A contract' vehicles are relatively most important in the tanker category where they comprise one-quarter of all tankers. This is to be expected, of

course, because of the importance of 'A contract' operation in the Chemicals industry.

Body type is, of course, determined mainly by the nature of business, thus 96 per cent of the tankers and 99 per cent of the bulk carriers in the Commodity Survey are in the Chemicals industry, and 70 per cent of the insulated vehicles are in Foodstuffs (see Table below). Although with a few exceptions (there are, for instance no tankers in the Electronic equipment and Paper industries) most types of vehicles are found in all industries, there are generally one or two body types that predominate in a particular industry. Thus in Foodstuffs over one-half of the vehicles have boxbodies, in Electronic equipment the same situation exists, whilst in Iron and Steel a similar proportion consist of platform vehicles, and in the Chemical industry over one-third are tankers.

**Table 107: Distribution of vehicles according to body type and licence class**

| Body Type    | Percentage    |          |              |
|--------------|---------------|----------|--------------|
|              | Licence Class |          |              |
|              | 'C'           | 'C' hire | 'A Contract' |
| Tipper       | 2 (3)         | 2        | 3 (20)       |
| Platform     | 31 (29)       | 28       | 37 (44)      |
| Boxbody      | 12 (1)        | 22       | 14 (13)      |
| Boxbody (F)  | 40 (17)       | 35       | 12 (1)       |
| Tanker       | 4 (0)         | —        | 9 (0)        |
| Bulk Carrier | —             | —        | —            |
| Insulated    | — (0)         | —        | — (0)        |
| Other        | 11 (16)       | 15       | 5 (5)        |
| Total        | 100 (100)     | 100      | 100 (100)    |

Notes: (1) 'F' licence vehicles have been excluded as there were no firm observations in this category.

(2) The figures in brackets relate to the 1962 Road Goods Transport Survey.

(3) Boxbody (F) refers to boxbodies with special fittings.

Source: General Survey.

**Table 108: Distribution of vehicles according to body type over the industries selected.**

| Body Type    | Percentage |           |                |                      |       |       |
|--------------|------------|-----------|----------------|----------------------|-------|-------|
|              | Foodstuffs | Chemicals | Iron and Steel | Electronic equipment | Paper | Total |
| Tipper       | 2          | 36        | 26             | 3                    | 13    | 100   |
| Platform     | 30         | 34        | 38             | 4                    | 24    | 100   |
| Boxbody      | 43         | 6         | 31             | 18                   | 22    | 100   |
| Boxbody (F)  | 34         | 23        | 8              | 16                   | 29    | 100   |
| Tanker       | 1          | 96        | 3              | —                    | —     | 100   |
| Bulk Carrier | 1          | 99        | —              | —                    | —     | 100   |
| Insulated    | 70         | 4         | 24             | —                    | 2     | 100   |
| Other        | 5          | 22        | 19             | 14                   | 40    | 100   |

Note: Boxbody (F) refers to boxbodies with special fittings.

Source: Commodity Survey.

The tendency for vehicles of certain licence classes to be more prominent in some body type categories than others is again apparent in the Commodity Survey. Half of the tankers and nearly three-quarters of the bulk carriers are 'A contract' vehicles whilst over all categories 'A contract' vehicles account for less than one-quarter of all vehicles, and nine-tenths of the boxbody vehicles with special fittings are 'C' licence whilst over all categories the proportion is only three-quarters.

#### Private rail sidings and canal berths

Out of the 722 establishments in the two Surveys 100 (14 per cent) had private rail sidings. Such a high number is due both to the size bias in the sample and the frequency of private sidings in certain industries, 41 of the private sidings appearing, in fact, in the Commodity Survey. From the Table 109 which is taken from the Commodity Survey it can be seen that nearly one-half of the 49 large establishments had private rail sidings compared with one-sixth and one-twelfth of the medium and small establishments respectively.

**Table 109: Establishments with private rail sidings in selected industries**

| Size<br>(employees) | Number of establishments |           |                      |                              |       |       |
|---------------------|--------------------------|-----------|----------------------|------------------------------|-------|-------|
|                     | Industry                 |           |                      |                              |       |       |
|                     | Foodstuffs               | Chemicals | Iron<br>and<br>Steel | Electronic<br>equip-<br>ment | Paper | Total |
| Over 400            | 1                        | 12        | 17                   | 3                            | 9     | 42    |
| 100-400             | 1                        | 14        | 9                    | 1                            | 6     | 31    |
| Under 100           | 1                        | 6         | —                    | —                            | —     | 7     |
| Not known           | —                        | —         | 1                    | —                            | —     | 1     |
| Total               | 3                        | 32        | 27                   | 4                            | 15    | 81    |

Source: Commodity Survey.

This high frequency of private sidings is, however, due much more to the nature of the industries in the Commodity Survey than to the size of establishments, with nearly three-quarters of the private sidings appearing in the two industrial groups Iron and Steel and Chemicals. In the General Survey which is unbiased with respect to commodity, one-tenth of the large establishments had private sidings compared with only half that proportion in medium and small establishments.

The reliance of the Iron and Steel and Chemical industries on private sidings (one-half of the establishments in the Chemical and Iron and Steel industries had private sidings) also accounts for the low number (one-tenth) of leased sidings in the Commodity Survey compared with the General Survey (one-third), for non-use is much less frequent in these two industries than others (see Table 110).

The distribution of private canal berths is similar to that of private rail sidings with a concentration amongst the large establishments and in the Chemical, Iron and Steel and Paper industries. The incidence of canal berths is, however, much lower with only 5 (1 per cent) establishments in the General Survey and 29 (8 per cent) in the Commodity Survey owning such facilities.

The frequency of non-use, 14 per cent of berths in the Commodity Survey and 60 per cent in the General Survey, is again probably a function of type of industry, but with only 5 observations to draw upon in the General Survey it is impossible to draw any exact conclusions.

The great difference between the use of private rail sidings and canal berths is in the high number of berths (one-half in the Commodity Survey) that are used for receipts only compared with a very low number (one-tenth) of rail sidings used for receipts only. This difference is explained by the fact that the raw materials for the Chemical, Iron and Steel and Paper industries are often in a suitable form to be shipped by canal, and so long as sufficient can be kept in the 'pipe-line' the slowness of this form of transport is not a hindrance to production.<sup>1</sup> Products leaving these industries may, however, not be suitable for canal carriage,<sup>2</sup> and they must be shipped to customers who probably have no canal berths, and where the possibilities of transshipment to another mode for delivery are nowhere near as great as in the case of the railways.

<sup>1</sup> See Chapter 3, Part III for a discussion on the requirements of speed by firms in order to keep stocks low.

<sup>2</sup> Chemicals, for instance, might require very stringent conditions with respect to temperature and safety.

Rail sidings and canal berths are owned by those firms which have large flows of bulk traffic sufficient to fill trains and barges. The firms must, therefore, be large, and are concentrated in the Chemical, and Iron and Steel industries where there are relatively frequent shipments of train load size (see p. 120).

**Table 110: Use made of private rail sidings in selected industries**

| Nature of Business   | Number of establishments |               |                       |            |       |
|----------------------|--------------------------|---------------|-----------------------|------------|-------|
|                      | Despatch Only            | Receipts Only | Despatch and Receipts | Not in Use | Total |
| Foodstuffs           | —                        | —             | 1                     | 3          | 3     |
| Chemicals            | 1                        | 2             | 38                    | 1          | 32    |
| Iron and Steel       | —                        | 1             | 34                    | 2          | 27    |
| Electronic equipment | —                        | 1             | 2                     | 1          | 4     |
| Paper                | 2                        | 4             | 6                     | 3          | 15    |
| Total                | 3                        | 8             | 62                    | 9          | 81    |

Source: Commodity Survey.

**Table 111: Establishments with private canal berths in selected industries**

| Size (emp/999) | Industry   |           |                |                      |       |
|----------------|------------|-----------|----------------|----------------------|-------|
|                | Foodstuffs | Chemicals | Iron and Steel | Electronic equipment | Paper |
| Over 999       | 1          | 7         | 6              | —                    | 5     |
| 100-999        | 1          | 3         | —              | —                    | 2     |
| Under 100      | 1          | —         | 1              | —                    | 2     |
| Total          | 3          | 10        | 7              | —                    | 9     |

Source: Commodity Survey.

**Table 112: Use made of private canal berths in selected industries**

| Nature of Business   | Number of establishments |               |                       |            |       |
|----------------------|--------------------------|---------------|-----------------------|------------|-------|
|                      | Despatch Only            | Receipts Only | Despatch and Receipts | Not in Use | Total |
| Foodstuffs           | —                        | 2             | —                     | 1          | 3     |
| Chemicals            | 1                        | 5             | 4                     | —          | 10    |
| Iron and Steel       | —                        | 1             | 4                     | 2          | 7     |
| Electronic equipment | —                        | —             | —                     | —          | —     |
| Paper                | —                        | 5             | 3                     | 1          | 9     |
| Total                | 1                        | 13            | 11                    | 4          | 29    |

Source: Commodity Survey.

#### Ownership and hiring of railway wagons

Only just over one-quarter of the 81 establishments in the Commodity Survey with private rail sidings owned railway wagons but this is slightly higher than in the General Survey where only 4 of the 19 establishments with private sidings

owned wagons. As might have been expected from the discussion on private sidings ownership of wagons is concentrated in the large establishments and in the Chemicals and Iron and Steel industries. 11 (12 per cent) of the 89 large establishments in the Commodity Survey own wagons and this comprised exactly one-half of the establishments owning wagons, all but one of the remaining 11 being in the medium size group, whilst the concentration of wagon owning in the Chemical and Iron and Steel industries is even greater than that of private sidings (see Table 113). Nearly one-half of the firms owned comprised less than 25 wagons, but at the other end of the scale there was one establishment with over 500 wagons and one with over 1,000.<sup>1</sup>

15 establishments in the Commodity Survey hired wagons<sup>2</sup> compared with 2 in the General Survey. There is the same concentration amongst the large establishments (60 per cent of establishments hiring wagons had over 499 employees) that occurred in the case of ownership but there is less concentration in the Chemical and Iron and Steel industries (see Table below). Although hiring occurs almost as frequently as ownership the size of the hired fleets is smaller with two-thirds being less than 25 wagons, and the largest less than 500.

**Table 113: Ownership of railway wagons in selected industries**

| Nature of Business   | Number of establishments |       |        |         |         |          |           |       |
|----------------------|--------------------------|-------|--------|---------|---------|----------|-----------|-------|
|                      | Number of Wagons         |       |        |         |         |          |           |       |
|                      | Under 25                 | 25-50 | 51-100 | 101-250 | 251-500 | 501-1000 | Over 1000 | Total |
| Foodstuffs           | —                        | —     | —      | —       | —       | —        | —         | —     |
| Chemicals            | 6                        | 1     | 3      | 2       | —       | —        | 1         | 13    |
| Iron and Steel       | 3                        | —     | —      | 3       | —       | 1        | —         | 7     |
| Electronic equipment | —                        | —     | —      | —       | —       | —        | —         | —     |
| Paper                | 1                        | —     | 1      | —       | —       | —        | —         | 2     |
| Total                | 10                       | 1     | 4      | 5       | —       | 1        | 1         | 22    |

Source: Commodity Survey.

**Table 114: Hiring of railway wagons in selected industries**

| Nature of Business   | Number of establishments |       |        |         |         |          |           |       |
|----------------------|--------------------------|-------|--------|---------|---------|----------|-----------|-------|
|                      | Number of Wagons         |       |        |         |         |          |           |       |
|                      | Under 25                 | 25-50 | 51-100 | 101-250 | 251-500 | 501-1000 | Over 1000 | Total |
| Foodstuffs           | 1                        | —     | —      | —       | —       | —        | —         | 1     |
| Chemicals            | 4                        | —     | —      | 2       | —       | —        | —         | 6     |
| Iron and Steel       | 1                        | 1     | —      | —       | 1       | —        | —         | 3     |
| Electronic equipment | 2                        | —     | —      | —       | —       | —        | —         | 2     |
| Paper                | 2                        | —     | —      | 1       | —       | —        | —         | 3     |
| Total                | 10                       | 1     | —      | 3       | 1       | —        | —         | 15    |

Source: Commodity Survey.

<sup>1</sup> With each small number a commentary on the General Survey is not possible; of the 4 establishments owning wagons 2 were in the Electrical Goods industry and 1 each in Chemicals and Iron and Steel, 3 of the fleets were under 25 wagons and the other was between 251 and 500 wagons.

<sup>2</sup> 3 of these also owned wagons and of the 2 establishments in the General Survey hiring wagons 1 also owned wagons.

## The use of rail transport

In the analyses undertaken so far in this book the railways have generally been treated as offering one service, *ie* transport; no distinction has been made between the types of rail service available to manufacturers—although the extent to which various services are used is reflected in the results of the various analyses that have been made, for example, in the probability analysis in Part I.

Some 8,000 of the 64,000 consignments on which the General Survey was based, were carried by rail on the main part of their journey. A detailed analysis of these consignments, in terms of size, length of haul, etc., has been given in Part II, Chapter 1 but in addition to this information it would be useful to know (a) which rail service is used for different types of consignment—whether parcels, freight liner, wagon load, and so on, and (b) what method of collection is employed to move the goods from the consigner's premises to the rail-head. Information on (a) is particularly relevant since there are different types of rail service and some are declining others are growing.

### *Types of rail service used*

Over three-quarters of the rail borne movements picked up in the General Survey were handled by the railways' parcels service, *ie* parcel traffic by passenger train and sundries traffic by freight train. Some 4,000 consignments were handled by the former service, consisting almost entirely of manufactured goods; 2,500 by the latter, consisting of a wide range of commodities but predominantly of finished manufactures.

The most common size of parcel sent by passenger train was between 23 and 112 lbs, but smaller ones of up to 22 lbs and slightly larger ones of between 112 and 560 lbs were not uncommon. Few movements occurred of a size greater than 560 lbs. However, the variation in consignment size sent by freight sundries service was much larger with some consignments being as light as 22 lbs, others weighing up to 1 ton or more. Most, 86 per cent, were however in the 23 lbs to 560 lbs range.<sup>1</sup>

The length of haul involved was extremely varied, ranging from less than 25 miles to over 300 miles in the case of both services, but predominantly it was in the 100 to 200 miles bracket with a peaking of consignments by passenger train in the 150–200 mile range and of freight sundries traffic in the 100–150 mile range.

Cost (to the manufacturer) of carriage was substantially higher by passenger train than by freight train service. On average, it cost about 2 pence per lb to use the passenger train parcels service compared with 1d by freight train. On both services, there was considerable variation about the average

depending on the weight of the consignment and the distance handled—cost increased with size and distance but not on a pro-rata basis, so that expressed in unit terms, is cost per lb and per lb mile, the heavier the consignment or the longer the haul the cheaper the cost (see also Chapter 2, p. 86).

The next most often used rail service was full wagon traffic. Some 550 consignments were sent by this service, 7 per cent of all rail-borne consignments. They consisted mainly of iron and steel products, processed foods and manufactured fuels; little use was made of this type of rail service by other industries. Two thirds of the consignments were over 7½ tons in weight and the most common length of haul was between 100 and 150 miles.

Liner train services were used for about 300, 4 per cent, of the rail-borne consignments included in the General Survey, but freight liner services were in their infancy at the time the survey was being undertaken and the proportion is probably very much higher at the time of writing this report.<sup>2</sup> Of the freight liner consignments picked in 1966, all were of manufactured goods and a high proportion were of small consignments of up to 560 lbs; journey lengths were mainly over 300 miles.

Full train load traffic serving manufacturing industry was also in embryonic form in early 1966 and the share in total consignments shown by the present results is probably an out-dated estimate.

Thus far the analysis has provided a broad indication of the type of rail service used by a wide range of manufacturing industry. To study the demand for each service in fuller detail it is necessary to turn to the results of the Commodity Survey with its emphasis on the transport demand of particular, narrowly defined, industries.

In the first industry studied, bacon curing, meat, fish, fruit and vegetable processing (MLN 214 and 218), rail services as a whole were relatively little used and out of 25,000 consignments made only about 500 were shipped by rail. The type of rail services most commonly used were the passenger train parcels and freight sundries services, which accounted for 90 per cent of all rail-borne consignments made by this industry. Size of consignment was predominantly in the range 23–112 lbs by the former service, 112–560 lbs by the latter.

On average, the cost of consigning for this industry was about 7 pence per lb by passenger train and about 0.5 pence per lb by freight train parcel traffic, and it is interesting to note that all the consignments sent by passenger train were raw or semi-processed foodstuffs (therefore highly perishable) while those sent by freight train parcels traffic were processed foods.

<sup>1</sup> This compares with 79 per cent in 1961—see the relevant Table (page 34) of the Working Report on the 'Reshaping of British Railways'.

<sup>2</sup> For example linings by freight liner in an average week in 1966 was 4.3 thousand tons and in 1967 it was 17.75 thousand tons.

Table 115: Use of various types of rail service

| Commodity                        | Number of consignments     |                   |            |         |            |       |       |    |
|----------------------------------|----------------------------|-------------------|------------|---------|------------|-------|-------|----|
|                                  | Type of Service            |                   |            |         |            |       | Total |    |
|                                  | Parcels by passenger train | Freight motorcars | Full wagon | Linear† | Full train | Other | No.   | %  |
| Foodstuffs                       | —                          | 90                | 190        | —       | 180†       | —     | 460   | 3  |
| Crude materials                  | 200                        | —                 | —          | —       | —          | —     | 200   | 11 |
| Chemicals                        | 10                         | 80                | 30         | —       | —          | —     | 100   | 3  |
| Building materials               | 30                         | 30                | 30         | —       | —          | —     | 90    | 3  |
| Iron and steel                   | 10                         | 390               | 150        | —       | 10         | —     | 560   | 33 |
| Nonferrous metals                | 40                         | 30                | —          | —       | —          | —     | 70    | 3  |
| Electrical goods                 | 220                        | 270               | —          | 10      | —          | —     | 500   | 16 |
| Transport vehicles and equipment | 150                        | 150               | —          | 10      | —          | —     | 310   | 12 |
| Metal manufacturers              | 180                        | 190               | —          | —       | —          | —     | 370   | 12 |
| Other manufacturers              | 3,380                      | 1,250             | 190        | 280     | —          | 10    | 5,010 | 30 |
| All commodities                  | 4,120                      | 2,500             | 510        | 300     | 190        | 10    | 7,670 | 13 |

Source: General Survey

— Indicates less than 5.

\*Total by rail as % of total by all modes.

†Including 170 consignments of manufactured fuel.

‡Sampling error large.

§Including express traffic carried by liner services.

Table 116: Size of consignments sent by different types of rail service

| Table 1367. Size of consignments by service type in 1940-41 |                                      |                     |                      |                       |                 |                   |         | Percentages |
|---|--------------------------------------|---------------------|----------------------|-----------------------|-----------------|-------------------|---------|-------------|
| Type of Service   | Distribution of consignments by size |                     |                      |                       |                 |                   |         | Total       |
|   | Over<br>Not over 22 lbs.             | 22 lbs.<br>112 lbs. | 112 lbs.<br>360 lbs. | 360 lbs.<br>2240 lbs. | 1 ton<br>5 tons | 5 tons<br>10 tons | 10 tons |             |
| Parcels by passenger train                                  | 23                                   | 33                  | 30                   | 3                     | —               | —                 | —       | 100         |
| Freight motorcars   | 3                                    | 45                  | 41                   | 10                    | 1               | —                 | —       | 100         |
| Full wagon  | —                                    | —                   | —                    | 2                     | 29              | 36                | 33      | 100         |
| Liner   | 12                                   | 25                  | 49                   | —                     | 6               | 5                 | 3       | 100         |
| Full train  | —                                    | —                   | —                    | —                     | (15)            | (33)              | (42)    | 100         |

() Sampling error large.

Source: General Survey.

Table 117: Length of haul by different types of rail service

| Percentage                     |  |                |                |                 |                  |                  |                  |                  |        |       |
|--------------------------------|--|----------------|----------------|-----------------|------------------|------------------|------------------|------------------|--------|-------|
| Type of Service                | Distribution of consignments by length of haul |                |                |                 |                  |                  |                  |                  |        | Total |
|                                | Over<br>Not over 25 miles                      | 25 m.<br>50 m. | 50 m.<br>75 m. | 75 m.<br>100 m. | 100 m.<br>125 m. | 125 m.<br>150 m. | 150 m.<br>200 m. | 200 m.<br>300 m. | 300 m. |       |
| Parcels by passenger<br>trains | 1  | 14             | 11             | 5               | 10               | 3                | 26               | 20               | 5      | 100   |
| Freight motorcars              | 3  | 13             | 8              | 9               | 13               | 11               | 16               | 13               | 13     | 100   |
| Full wagons                    | 4  | 3              | 5              | 6               | 22               | 21               | 12               | 30               | 7      | 100   |
| Liner                          | —  | —              | —              | —               | —                | —                | 13               | 11               | 76     | 100   |
| Full train                     | 5  | —              | —              | —               | 8                | —                | 16               | 32               | 39     | 100   |

Source: General Survey

The second industry chosen for intensive study was the chemicals and dyestuffs industry (MLH 271). This group of activities was a more important user of rail transport than the foodstuffs group and in 1965 sent about a quarter of its consignments by rail, mainly by the freight sundries service and full wagon traffic. Passenger train parcels services were not infrequently used however and use was also made of each of the other services offered by British Railways—except express service.

Almost all consignments by the full wagon service were greater than a ton in weight and a third were over 10 tons, while the sundries traffic generated by this industry mainly consisted of consignments of between 23 lbs and 560 lbs. All the consignments sent by passenger train were less than 560 lbs.

The chemicals industry was the only one of the five industries covered by the Commodity Survey to use air's condor service. Some 160 consignments were sent by this service, all were in the weight range 113 lbs to 560 lbs. Use of liner trains occurred for consignments up to 5 tons and, full train services, when used, normally involved movements greater than 10 tons.

Average cost of carriage by the two forms of parcels services were about 6 pence and 1 pence per lb respectively. Cost of full wagon movements was substantially lower at 0.2 to 0.3 pence per lb however while full train loads were cheapest of all at about 0.1 pence per lb. Substantial economies can therefore be achieved by industries capable of bulking their movements into the largest consignment size rail can handle, i.e. a full train load.\*

In the iron and steel industry (MLH 311), rail transport was used for about a third of all consignments made and in 7 cases out of every 10 the rail service used was full wagon traffic. Most

of the remaining rail-borne movements were handled by the category 'other' rail services. A few consignments occurred by the freight sundries service, passenger train, full train load and freight liner services.

The size of consignment by wagon load traffic was fairly large—half the movements were in lots weighing more than 7½ tons. Consignments by the 'other' group of services were also large, as were consignments by freight liner and, of course, full trains. Movements by freight sundries traffic were fairly evenly divided between large consignments of over 10 tons and small ones of less than 1 ton while all consignments by passenger train were less than 560 lbs.

Cost of carriage for the iron and steel industry was about 0.15 pence per lb when the full wagon service was used and slightly less for full train loads. Compared with chemicals, the cost of carriage in full wagons was cheaper in terms of cost per lb but slightly dearer in terms of cost per lb mile—suggesting shorter hauls by the iron and steel industry.

The electronic equipment industry (MLH 364) shipped about 11 per cent of its consignments by rail during the period studied, mainly by the passenger train parcels service. Relatively little use was made of other forms of rail transport, except to a small extent the freight sundries and full wagon service. Most common size of consignment by the parcels service was between 23 and 112 lbs, by freight sundries 23–560 lbs and by full wagon over 10 tons. Cost per lb of consigning by the latter two services tended to be higher for the electronics industry than for the other industries studied—except chemicals by sundries traffic.

The paper and board industry (MLH 481-3) used rail transport for about 6 per cent of its consignments and virtually all of these were despatched via the freight sundries service. The most common size of consignment was in the 113–560 lbs weight range (66 per cent of the total) but about 10 per cent were slightly larger (560–1120 lbs) and 25 per cent were slightly smaller. Average cost of consigning was about the same as for the chemical industry.

\* Unfortunately too few observations were available on which to base reliable comparisons of cost of carriage by freight liner service vis-à-vis other rail services. The only tentative conclusion that can be drawn from the results is that after allowing for differences in length of haul, cost of transporting by the freight liner service was about a third cheaper than by full wagon traffic.

Table 11B: Use of rail services by selected industries

| Type of Service            | Industry                      |   |                        |    |                             |    |                                   |    |                      |   |
|----------------------------|-------------------------------|---|------------------------|----|-----------------------------|----|-----------------------------------|----|----------------------|---|
|                            | Foodstuffs<br>(MLH 214 & 218) |   | Chemicals<br>(MLH 271) |    | Iron and steel<br>(MLH 311) |    | Electronic equipment<br>(MLH 364) |    | Paper<br>(MLH 481-3) |   |
|                            | No.                           | % | No.                    | %  | No.                         | %  | No.                               | %  | No.                  | % |
| Parcels by passenger train | 210                           | 1 | 1,250                  | 3  | 120                         | 1  | 1,360                             | 9  | 60                   | — |
| Freight sundries           | 210                           | 1 | 4,630                  | 12 | 390                         | 2  | 110                               | 1  | 1,300                | 6 |
| Full wagon                 | 53                            | — | 1,540                  | 9  | 6,280                       | 28 | 130                               | 1  | 20                   | — |
| Liner                      | —                             | — | 190                    | 1  | 70                          | —  | —                                 | —  | 20                   | — |
| Full train                 | —                             | — | 330                    | 1  | 90                          | —  | 20                                | —  | —                    | — |
| Other                      | —                             | — | 160                    | —  | 1,300                       | 6  | —                                 | —  | 30                   | — |
| All services               | 490                           | 2 | 16,100                 | 26 | 9,250                       | 29 | 1,690                             | 11 | 2,030                | 6 |

NA= number of consignments.

% = rail-borne consignments as per cent of total by all modes.

Source: Commodity Survey.



**Table 119: Use of rail services by selected industries, analysis by size of consignment**

| (a) Foodstuffs           |                        |           |            |             |        |         |    |       |  | Percentage |
|--------------------------|------------------------|-----------|------------|-------------|--------|---------|----|-------|--|------------|
| Rail Service             | Distribution by weight |           |            |             |        |         |    |       |  |            |
|                          | lbs                    |           |            |             | tons   |         |    |       |  |            |
|                          | Over<br>Not over 25    | 25<br>112 | 112<br>560 | 560<br>2240 | 1<br>5 | 5<br>10 | 10 | Total |  |            |
| Parcels                  | 32                     | 65        | 3          | —           | —      | —       | —  | 100   |  |            |
| Freight<br>sundries      | —                      | 29        | 58         | 12          | 1      | —       | —  | 100   |  |            |
| (b) Chemicals            |                        |           |            |             |        |         |    |       |  |            |
| Parcels                  | 4                      | 56        | 40         | —           | —      | —       | —  | 100   |  |            |
| Freight<br>sundries      | 30                     | 35        | 34         | 23          | 2      | 1       | —  | 100   |  |            |
| Full wagon               | —                      | —         | —          | 6           | 28     | 30      | 36 | 100   |  |            |
| Lease                    | —                      | 40        | —          | 40          | 20     | —       | —  | 100   |  |            |
| Full train               | —                      | —         | —          | —           | 10     | —       | 90 | 100   |  |            |
| Other                    | —                      | —         | 100        | —           | —      | —       | —  | 100   |  |            |
| (c) Iron and Steel       |                        |           |            |             |        |         |    |       |  |            |
| Parcels                  | 46                     | 42        | 12         | —           | —      | —       | —  | 100   |  |            |
| Freight<br>sundries      | —                      | 35        | 29         | 16          | —      | —       | 40 | 100   |  |            |
| Full wagon               | —                      | —         | —          | 8           | 28     | 27      | 37 | 100   |  |            |
| Other                    | —                      | —         | —          | 12          | 24     | 59      | 5  | 100   |  |            |
| (d) Electronic equipment |                        |           |            |             |        |         |    |       |  |            |
| Parcels                  | 26                     | 38        | 14         | —           | —      | —       | —  | 100   |  |            |
| Freight<br>sundries      | 7                      | 36        | 38         | 30          | 9      | —       | —  | 100   |  |            |
| Full wagon               | —                      | —         | —          | 4           | 13     | 20      | 63 | 100   |  |            |
| (e) Paper                |                        |           |            |             |        |         |    |       |  |            |
| Freight<br>sundries      | —                      | 25        | 58         | 34          | 3      | —       | —  | 100   |  |            |

Source: Commodity Survey.

### Comparative costs

Although the information available is too limited for a detailed comparison of the cost of transporting by each of the rail services on offer to manufacturers, the data is perhaps sufficient for a few generalisations to be made.

The General Survey, with its wider range of commodities and type of consignment yielded relatively little that could be of value to an assessment of comparative costs, the only reliable indicators that emerged were the reduction in cost per lb with size (weight) of consignment and in cost per lb mile with distance hauled. The Commodity Survey on the other hand, since it isolates one of the causes of variation in costs, *ie* type of commodity, yielded more useful information. The results showed that, cost-wise,<sup>1</sup> the rail services fall into two categories, the first catering for small consignments of up to about a ton, the second catering for larger consignments.

Two main services compete for the first type of traffic, the passenger train parcel service and the freight sundries service.<sup>2</sup> The latter is substantially cheaper than the former for all commodities, consignment size<sup>3</sup> and distance. Both services offer considerable reductions in cost per lb and per lb mile with increasing size and length of haul. The Parcel service also falls mainly into the parcel traffic category, but little use was made of this service.

For larger consignments, manufacturers could choose between three services, freight liner,<sup>4</sup> full wagon and, if the consignment was sufficiently large, full train. Not surprisingly, the latter service offered the cheapest means of transport by rail, but relatively little use was made of the service even by a major rail user such as the iron and steel industry. A feature of the full train service was the small variation in the unit cost (per lb mile) of transporting over various distances, except the lowest bracket of less than 50 miles, on which hauls were three to four times more costly (in terms of per lb mile).

**Table 120: Costs of consigning (pence per 10 lbs)**

| Commodity      | Weight (lb/ton) | Rail service |          |            |            |
|----------------|-----------------|--------------|----------|------------|------------|
|                |                 | Parcels      | Sundries | Full wagon | Full train |
| Foodstuffs     | Over            |              |          |            |            |
|                | 22 lbs          | 90           | 7        |            |            |
|                | 112 "           | 70           | 5        |            |            |
| Chemicals      | 22 lbs          |              | 35       |            |            |
|                | 112 "           | 60           | 20       |            |            |
|                | 560 "           | 40           | 15       |            |            |
|                | 2240 "          |              | 7        | 5          |            |
|                | 1 ton           |              | 2        | 3          |            |
|                | 5 tons          |              |          | 2          |            |
| Iron and Steel | 22 lbs          |              |          |            |            |
|                | 112 "           | 70           | 25       |            |            |
|                | 560 "           | 5            | 7        |            |            |
|                | 2240 "          |              | 6        | 3          |            |
|                | 1 ton           |              |          | 1.5        |            |
|                | 5 tons          |              |          | 1.5        |            |
| Electronics    | 22 lbs          |              |          |            |            |
|                | 112 "           | 70           | 30       | 16         |            |
|                | 560 "           | 5            | 14       |            |            |
|                | 10 tons         |              |          |            | 1.7        |
| Paper          | 22 lbs          | 90           |          |            |            |
|                | 112 "           | 60           | 11       |            |            |
|                | 560 "           |              | 5        |            |            |

Source: Commodity Survey.

Full wagon costs displayed the same characteristics as parcels services costs in that, on a unit basis, they declined with size and length of haul. This service is a bridge between small consign-

<sup>1</sup> *ie* to the manufacturer.

<sup>2</sup> The freight sundries service was transferred to the National Freight Corporation on January 1st 1969.

<sup>3</sup> That is with the exception of consignments under 16 lbs.

<sup>4</sup> Freight liner services were also transferred to the National Freight Corporation on 1st January 1969 but with the Railways Board continuing to hold shares in the Freight Line Company.

ments and full train load movements and therefore costs of consigning the smaller consignments by this means are fairly similar to the costs of sending by the freight tenders service while the cost of the larger consignments approach the cost of full train movements. The latter are never quite equalled however since a consignment which constitutes a train load is always cheaper to move on a per lb basis than the consignment which just fails to make a full train load.

For some traffic, the Freight Liner Service is in competition with the full wagon service and, in theory, because of economies in transport liner service costs should be below full wagon costs. This was indeed the case in the few instances where the comparison could be made, but the observations were very few and no detailed assessment of the costs of consigning by *aa*'s freight liner service can be made on the basis of the present survey.

Two other types of rail service were differentiated in the survey, the express export service and the 'other' group, apart from the use of the latter by the iron and steel industry these services were little used and no comparisons of cost are possible.

#### Method of collection

In addition to a choice of services, when using rail transport manufacturers could also choose between different methods of collection of their consignments for the journey to the rail-head. The latter choice is a limited one however; it is limited by (a) the absence of rail-siding connection and (b) the railway's own practices with regard to collection and delivery. The first restriction naturally precludes the use of a *aa* locomotive as a means of collecting a consignment from an establishment; the second means that the manufacturer, who is hiring the railway's services for all stages of the despatch, is often not asked to choose between different methods of collection—this is done for him by railway management.

Given these conditions, the pattern of collection of consignments for carriage by the various rail services is very much as might be expected. For example, all consignments carried by the full train load service were collected from the manufacturer's establishment by B.R. loco and each of these establishments was therefore rail siding connected. Similarly, virtually all the full wagon traffic was moved to the rail-head by locomotive but, rather significantly, the few that were not consisted entirely of finished manufactured goods compared with the iron and steel products, fuel and processed foodstuffs which formed over 95 per cent of loco collected full wagon traffic. This pattern reflects the findings of the data collected about the characteristics of the establishments surveyed where the absence of rail siding connections to establishments producing finished goods is clearly illustrated and given that freight-liner services are an alternative to full wagon services, the future full wagon traffic of British Rail will probably be confined to the relatively few rail siding connected industries. Since most of the latter industries are, at best, slow growing industries, the share of the full wagon service in *aa*'s total freight traffic will almost certainly decline.

The two parcels services of *aa* were the most flexible with regard to methods of collection. Even on these services, however, *aa*'s own road vehicles were used on between 80 and 90 per cent of the consignments; the road haulier was hardly ever used and the manufacturer's own vehicle was only fairly commonly used for consignments going by passenger train. It is interesting to note that in two industries, transport vehicles and equipment, and metal manufactures, the proportion

moved to the rail-head by own transport for rail movement by passenger train was far higher than by *aa* road vehicle.

As regards the freight liner service, at the time the present survey was undertaken, because of Union opposition, only *aa* vehicles could carry the containers to the liner terminals. Hence, the 100 per cent figure for *aa* vehicles shown by the results of the survey. The position at the time of writing is likely to be rather changed since, in the meantime, the Unions have withdrawn their objection and freedom of access is now granted to hauliers and transport vehicles operated on own account.

Table 121: Type of rail service used and method of collection

| Type of service†           | Method of collection |     |              |     |              |   |            |    |
|----------------------------|----------------------|-----|--------------|-----|--------------|---|------------|----|
|                            | B.R. loco            |     | B.R. vehicle |     | Road haulier |   | 'C' owner* |    |
|                            | No.                  | %   | No.          | %   | No.          | % | No.        | %  |
| Parcels by passenger train | 20                   | —   | 3,168        | 86  | 60           | 2 | 970        | 14 |
| Freight tenders            | 170                  | 7   | 3,334        | 89  | 60           | 2 | 40         | 2  |
| Full wagon                 | 410                  | 85  | 10           | 5   | —            | — | —          | —  |
| Liner                      | —                    | —   | 300          | 100 | —            | — | —          | —  |
| Full train                 | 190                  | 100 | —            | —   | —            | — | —          | —  |
| Other                      | —                    | —   | 30           | 100 | —            | — | —          | —  |
| All services               | 808                  | 12  | 3,730        | 77  | 120          | 2 | 610        | 9  |

† The totals for each type of service do not necessarily equal those given in Table 1 since in some cases method of collection was not stated.

\* *aa* manufacturer's own transport.

No. = numbers of consignments

% = per cent of all consignments sent by each type of service.

Source: General Survey.

The results of the Commodity Survey confirm those of the General Survey and add relatively little to the information obtained about the overall pattern of collection of rail borne consignments.

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# Appendices

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## The sample

### Pilot survey and replacements

A pilot survey of 38 establishments was made in the London area, and as a result a number of slight modifications, mainly concerned with increasing the number of definitions, were made to the questionnaire. The name of the Survey (originally called the Skipper Survey) was also changed as this was frequently interpreted as applying only to carriage by ships. The pilot also brought to light a weakness in the Sampling Frame. As always a number of establishments had gone out of business since the Frame was compiled, and 3 such establishments out of 38 was not excessively high, but the Frame also contained a large number of non-manufacturing establishments. These non-manufacturing establishments were of two types, those that had no connection at all with manufacturing, and those which were non-manufacturing divisions of manufacturing firms or groups. It was these latter that were a problem for they included a great many head offices and these are concentrated in the London area. Twelve of the 38 establishments in the Pilot were, in fact, non-manufacturing, but this exceptionally high figure was caused by carrying out the Pilot in London.

As there was little likelihood of a regional bias amongst establishments which had gone out of business there was no problem in replacing them, but because of the preponderance of head offices in London replacement of these by manufacturing establishments in the London area would have over emphasised the number of manufacturing establishments in that area and led to a regional bias in the sample. It was decided, therefore, to delay replacements until the returns from all the manufacturing establishments had been received; the distribution of these was then determined for the six areas of the General Survey and the Administrative Regions of the Commodity Survey and the replacements were then allocated according to these proportions.<sup>1</sup>

For the General Survey establishments were replaced randomly according to the six areas, and in the Commodity Survey establishments were replaced randomly from establishments that had the same Minimum List Heading as those needing replacement according to the nine Administrative Regions. If another non-manufacturing establishment were drawn it was replaced by another establishment in the same area, and of the same Minimum List Heading if in the Commodity Survey.

### Response Rates

Of the 1,015 establishments sampled 722 (71 per cent) completed the questionnaire in a manner that was suitable for analysis. This was an extremely high response rate for a survey that was completely voluntary and which entailed a great deal of work in completing the questionnaire. As might have been expected the completing of consignment notes was the greatest difficulty, and 70 establishments did, in fact, complete Parts I and II but as they did not complete any consignment notes they had unfortunately to be omitted. The break down of the response rates for the various parts of the two surveys is given below.

### General Survey Response

Of the original 513 establishments sampled 303 completed questionnaires satisfactorily, no trace or contact could be made with 13, 122 establishments refused to take part in the Survey, and 75 establishments were non-manufacturing. This 15 per cent of non-manufacturing establishments was, as expected, lower than the Pilot, but was sufficiently high to have warranted the replacement method employed. Of the 88 establishments (13 no longer in business plus 75 non-manufacturing) that needed replacing 58 completed questionnaires in a manner suitable for analysis.<sup>2</sup> The overall response rate was, therefore, 361 establishments (70 per cent).

### Commodity Survey Response

Of the 502 original establishments in the Survey, 300 completed questionnaires, no trace could be found of 8, 115 establishments refused to co-operate, and 79 establishments were non-manufacturing. The proportion of non-manufacturing establishments (16 per cent) was similar to that in the General Survey, and of the 87 establishments (8 no longer in business plus 79 non-manufacturing) that were replaced 26 refused to take part.<sup>3</sup> The overall response rate of 72 per cent (361 establishments) was very similar, therefore, to the General Survey.

### Analysis of non-response

The 152 establishments that refused to take part in the General Survey were distributed amongst the nine Nature of Business groupings used in the analysis as in the table below.

<sup>1</sup> *op. cit.* London and the South East had 20 per cent of manufacturing establishments in the Commodity Survey, 20 per cent of the total number of non-manufacturing establishments that had to be replaced were replaced in that region, even though 40 per cent of the establishments that needed replacing were from that region.

<sup>2</sup> Several rounds of replace trials were necessary.

**Table 122: Analysis of non-response in the General Survey according to Nature of Business**

| 1<br>S.I.C.<br>Order | 2<br>Description                                | 3<br>Establishments<br>Replying | 4<br>Establishments<br>Not<br>Replying | 5<br>Total | Col. 4<br>as %<br>of 3 |
|----------------------|---|---------------------------------|--|------------|------------------------|
| III                  | Food, drink, tobacco                            | 39                              | 16                                     | 36         | 44%                    |
| IV                   | Chemicals and allied<br>industries              | 14                              | 4                                      | 20         | 20%                    |
| V                    | Metal manufacture                               | 15                              | 5                                      | 20         | 25%                    |
| VI                   | Engineering and<br>electrical goods             | 82                              | 25                                     | 107        | 33%                    |
| VII & IX             | Shipbuilding and<br>metal goods non-<br>ferrous | 14                              | 11                                     | 25         | 44%                    |
| VIII                 | Vehicles  | 12                              | 3                                      | 15         | 20%                    |
| X-XII                | Textiles, leather goods<br>and clothing         | 116                             | 36                                     | 152        | 32%                    |
| XIII                 | Bricks, pottery, cement<br>etc.                 | 20                              | 7                                      | 27         | 36%                    |
| XIV-XVI              | Timber, paper, other<br>manufactures            | 66                              | 25                                     | 91         | 27%                    |
|                      | <b>Total</b>                                    | <b>361</b>                      | <b>152</b>                             | <b>513</b> | <b>38%</b>             |

The non-response rate was particularly high in Foodstuffs and Shipbuilding which would result in an under-representation of these industries in the analysis providing there was no bias in the drawing of the sample (see last section of this Appendix for comparison with national figures). For just over one-half of the establishments not responding it was possible to obtain figures on employment and an analysis of non-response according to size of establishment is given for these establishments in the Table below. Assuming that the establishments for which size could not be obtained are randomly distributed amongst the size groups, the non-response rate was significantly higher for small establishments than for the other two size categories which means that the overall size bias has been increased.

**Table 123: Analysis of non-response in the General Survey according to size of establishment**

| 1<br>Size<br>(employees) | 2<br>Establishments<br>replying | 3<br>Establishments*<br>not replying | 4<br>Col. 3 as % of<br>Col. 2 |
|--------------------------|---------------------------------|--------------------------------------|-------------------------------|
| Over 499                 | 57                              | 14                                   | 25                            |
| 100-499                  | 172                             | 35                                   | 20                            |
| Under 100                | 125                             | 39                                   | 31                            |
| Not known                | 7                               | 64                                   |                               |
| <b>Total</b>             | <b>361</b>                      | <b>152</b>                           | <b>30</b>                     |

Note\*: Information on size could only be obtained for 85 of the 152 establishments not replying.

The 141 establishments that refused to take part in the Commodity Survey were distributed amongst the Nature of Business groupings as in the Table 124.

**Table 124: Analysis of non-response in the Commodity Survey according to Nature of Business**

| 1<br>Industry           | 2<br>Establishments<br>replying | 3<br>Establishments<br>not replying | 4<br>Total | Col. 3 as %<br>of Col. 4 |
|-------------------------|---------------------------------|-------------------------------------|------------|--------------------------|
| Foodstuffs              | 53                              | 37                                  | 90         | 14%                      |
| Chemicals               | 67                              | 15                                  | 82         | 18%                      |
| Iron and Steel          | 54                              | 20                                  | 74         | 27%                      |
| Electronic<br>equipment | 74                              | 32                                  | 106        | 30%                      |
| Paper                   | 113                             | 47                                  | 160        | 29%                      |
| <b>Total</b>            | <b>361</b>                      | <b>148</b>                          | <b>509</b> | <b>29%</b>               |

The response rate in Chemicals was significantly higher than in the other industries but as the analysis in this Survey is done on an industry basis this is not serious. Although non-response is not increasing the size bias in the aggregate figures (see Table 125), this results from the exceptionally high response rate amongst small establishments in the Paper industry, in the other industries non-response is higher for small establishments than either medium or large ones.

Table 125: Analysis of non-response in the Commodity Survey according to Nature of Business and Size of Establishment

| 1<br>Nature of Business | Number Employed                 |                                     |                                  |                                 |                                     |                                  |                                 |                                     |                                   |
|-------------------------|---------------------------------|-------------------------------------|----------------------------------|---------------------------------|-------------------------------------|----------------------------------|---------------------------------|-------------------------------------|-----------------------------------|
|                         | Over 429                        |                                     |                                  | 100-429                         |                                     |                                  | Under 100                       |                                     |                                   |
|                         | 2<br>Establishments<br>replying | 3<br>Establishments<br>not replying | 4<br>Col. 3<br>as % of<br>Col. 2 | 5<br>Establishments<br>replying | 6<br>Establishments<br>not replying | 7<br>Col. 6<br>as % of<br>Col. 5 | 8<br>Establishments<br>replying | 9<br>Establishments<br>not replying | 10<br>Col. 9<br>as % of<br>Col. 8 |
| Foodstuffs              | 6                               | —                                   | —                                | 29                              | 7                                   | 24                               | 18                              | 6                                   | 33                                |
| Chemicals               | 16                              | 2                                   | 12                               | 31                              | 3                                   | 10                               | 19                              | 4                                   | 21                                |
| Iron and steel          | 21                              | 6                                   | 26                               | 28                              | 2                                   | 9                                | 6                               | 3                                   | 50                                |
| Electronic equipment    | 23                              | 3                                   | 13                               | 42                              | 9                                   | 21                               | 8                               | 2                                   | 35                                |
| Paper                   | 21                              | 7                                   | 33                               | 55                              | 20                                  | 36                               | 36                              | 4                                   | 11                                |
| Total                   | 89                              | 18                                  | 20                               | 180                             | 41                                  | 23                               | 87                              | 19                                  | 22                                |

Note: Information on this could only be obtained for 38 of the 141 establishments not replying.

Conclusions about the effect of non-response are made on the basis that there was no bias in the original sample. It was, however, possible to test some aspects of the returned sample against the population and this has been done in the final section of this Appendix.

#### Consignment response

16,571 consignment notes were completed by establishments in the Commodity Survey, an average of 46 per establishment, and 13,584 were completed in the General Survey, an average of 38 per establishment. Although 100 consignments were requested per establishment well over one-half of the establishments shipped less than 100 consignments during the survey period (see Table below).

Table 126: Total number of consignments shipped by establishments during survey period

|                  | Number of establishments |       |        |          |       |
|------------------|--------------------------|-------|--------|----------|-------|
|                  | Total consignments       |       |        |          | Total |
|                  | 0-25                     | 26-50 | 51-100 | Over 100 |       |
| General Survey   | 181                      | 53    | 69     | 129      | 342   |
| Commodity Survey | 35                       | 45    | 60     | 164      | 324   |
| Total            | 166                      | 98    | 129    | 213      | 606   |

Note: The total number of consignments shipped during the survey period was unknown for 36 establishments (hence the total of 606).

Taking mid points with a limit of 100 consignments per establishment the maximum number of consignments that could have been sampled was 19,500 in the General Survey and 23,300 in the Commodity Survey.<sup>4</sup> For both Surveys, therefore, the number of consignment notes completed was about 70 per cent of the number requested. Although there was little difference in the response rates of the two Surveys, a very much smaller sample of total consignments resulted in the Commodity Survey than in the General Survey. In the former only 16,571 (12 per cent) out of 141,568 were sampled, whilst in the latter 13,584 (21 per cent) out of 64,354 were sampled.

For the 56 establishments for which the total number of consignments during the sample week was unknown, the sample of consignments for each establishment was grossed according to the average for establishments of similar size and nature of business.

#### Post-card response

As had been anticipated this was the least satisfactory part of the Survey with only slightly over a 25 per cent response rate in both Surveys, there was, however, no indication that the low response was seriously biasing the Surveys (see Chapter 7). Two main factors contributed to this low response rate; firstly, no approach could be made to the consignee to ask for their co-operation; and secondly, as consignments are not always opened immediately on delivery the exact time of arrival was not necessarily remembered when the post-card was discovered.

#### Alternative charges survey response

For a number of reasons, such as ceasing to trade and change of personnel, it was only possible to ask 709 of the 722 establishments for costs of sending consignments by alternative modes, attaining a total of 6,528 consignments. The response rates of 80 per cent in the General Survey and 88 per cent in the Commodity Survey were exceptionally high. From the tables below it can be seen that the non-response had no significant effect upon the size bias already in the Survey, but in the General Survey the non-response of establishments in shipbuilding was, as in the main survey, significantly higher than in the other Orders, as was Electronics in the Commodity Survey.

<sup>4</sup> As General:  $(13 \times 113) + (38 \times 52) + (75 \times 69) + (100 \times 109) = 19,512$ .  
Commodity:  $(13 \times 35) + (38 \times 45) + (75 \times 60) + (100 \times 164) = 23,325$ .

Table 127: Analysis of non-response in the Alternative Cost Survey according to Nature of Business

| Order    | Description                          | General survey                         |  | Commodity survey                            |  |
|----------|--------------------------------------|--|--|---|--|
|          |                                      | 1<br>Establishments<br>not<br>replying | 2<br>Col. 1 as<br>% of<br>establish-<br>ments in<br>sample | 3<br>Establish-<br>ments<br>not<br>replying | 4<br>Col. 3 as<br>% of<br>establish-<br>ments in<br>sample |
| III      | Food, drink, tobacco                 | 1                                      | 5  | 5   | 9  |
| IV       | Chemicals and allied industries      | 2                                      | 12   | 3   | 4  |
| V        | Metal manufacture                    | 1                                      | 7  | 3   | 5  |
| VI       | Engineering and electrical goods     | 15                                     | 18   | 16  | 22   |
| VII & IX | Shipbuilding and metal goods s.e.s.  | 5                                      | 36   |   |  |
| VIII     | Vehicles                             | 2                                      | 17   |   |  |
| X-XII    | Textiles, leather goods and clothing | 26                                     | 22   |   |  |
| XIII     | Bricks, pottery, cement, etc         | 2                                      | 10   |   |  |
| XIV-XVI  | Timber, paper, other manufactures    | 18                                     | 28   | 14  | 12   |

Table 128: Analysis of non-response in the Alternative Cost Survey according to size of establishment

| Number employed | General Survey                      |   | Commodity Survey                         |   |
|-----------------|-------------------------------------|---|--|---|
|                 | 1<br>Establishments not<br>replying | 2<br>Col. 1 as %<br>of establish-<br>ments in<br>sample | 3<br>Establish-<br>ments not<br>replying | 4<br>Col. 3 as %<br>of establish-<br>ments in<br>sample |
| Over 499        | 7                                   | 12  | 10                                       | 11  |
| 100-499         | 36                                  | 21  | 23                                       | 13  |
| Under 100       | 28                                  | 22  | 8  | 9   |

#### Structural comparison of sample

The distribution of establishments, according to size and nature of business, responding to the two surveys was as in the Tables 129, 130.

Table 129: Establishments in General Survey analysed by size of establishment and Nature of Business

| S.I.C. Order | Description                          | Number of establishments |         |           |           |       |
|--------------|--------------------------------------|--------------------------|---------|-----------|-----------|-------|
|              |                                      | Number employed          |         |           |           |       |
|              |                                      | Over 499                 | 100-499 | Under 100 | Not known | Total |
| III          | Food, drink, tobacco                 | 3                        | 30      | 5         | 3         | 38    |
| IV           | Chemicals and allied industries      | 3                        | 8       | 4         | 1         | 16    |
| V            | Metal manufacture                    | 2                        | 6       | 7         | —         | 15    |
| VI           | Engineering and electrical goods     | 22                       | 37      | 23        | —         | 83    |
| VII & IX     | Shipbuilding and metal goods s.e.s.  | 2                        | 9       | 3         | —         | 14    |
| VIII         | Vehicles                             | 4                        | 5       | 3         | —         | 12    |
| X-XII        | Textiles, leather goods and clothing | 12                       | 60      | 39        | 2         | 116   |
| XIII         | Bricks, pottery, cement, etc         | 3                        | 8       | 9         | —         | 20    |
| XIV-XVI      | Timber, paper, other manufactures    | 6                        | 26      | 32        | 2         | 66    |
|              | Total number of establishments       | 57                       | 172     | 125       | 7         | 361   |

Table 130: Establishments in Commodity Survey analysed by size of establishment and nature of business

| Industry                       | Number employed |         |           |           |       |
|--------------------------------|-----------------|---------|-----------|-----------|-------|
|                                | Over 499        | 100-499 | Under 100 | Not known | Total |
| Foodstuffs                     | 6               | 28      | 18        | —         | 53    |
| Chemicals                      | 16              | 31      | 19        | 1         | 67    |
| Iron and Steel                 | 23              | 23      | 6         | 2         | 54    |
| Electronic equipment           | 28              | 42      | 8         | 1         | 79    |
| Paper                          | 21              | 55      | 16        | 1         | 113   |
| Total number of establishments | 89              | 180     | 87        | 5         | 361   |

The representativeness of the sample of establishments included in the General Survey can be determined by comparing the number of establishments responding in each SIC Order with the total number of such establishments as shown by the results of the 1958 Census of Production.<sup>2</sup>

**Table 131: Distribution of establishments in General Survey by SIC compared with UK distribution**

| S.I.C. Order | Description                       | Number of establishments in UK in 1958 |            | Establishments in General Survey |            | Sampling fraction (approx.) |
|--------------|-----------------------------------|--|------------|----------------------------------|------------|-----------------------------|
|              |                                   | No.                                    | % of total | No.                              | % of total |                             |
| III          | Food, drink, tobacco              | 9,233                                  | 10.0       | 30                               | 5.5        | 1/490                       |
| IV           | Chemicals and allied industries   | 3,566                                  | 3.8        | 16                               | 4.4        | 1/220                       |
| V            | Metal manufactures                | 2,076                                  | 3.2        | 15                               | 4.2        | 1/139                       |
| VI           | Engineering and electrical goods  | 14,982                                 | 16.2       | 82                               | 22.7       | 1/180                       |
| VII & IX     | Shipbuilding, metal goods a.s.a.  | 11,543                                 | 12.7       | 14                               | 3.9        | 1/290                       |
| VIII         | Vehicles                          | 2,289                                  | 4.1        | 12                               | 3.3        | 1/190                       |
| X-XII        | Textiles, leather goods, clothing | 19,996                                 | 21.6       | 116                              | 32.2       | 1/170                       |
| XIII         | Bricks, pottery, cement, etc      | 5,252                                  | 5.6        | 30                               | 5.5        | 1/260                       |
| XIV-XVI      | Timber, paper, other manufactures | 32,736                                 | 34.8       | 66                               | 18.3       | 1/290                       |
|              | Total                             | 92,715                                 | 100.0      | 361                              | 100.0      | 1/260                       |

As the above table shows the distribution of establishments responding in the General Survey accords fairly well with the industrial distribution of the total number of establishments in the country. The geographical bias has resulted in an over-representation of some industries and an under-representation of others but the only major imbalances are perhaps in Foodstuffs (Order III) and Shipbuilding (Orders VII and IX). The low response rates in both these orders accounts for a part of this and especially in Foodstuffs, but in addition the exclusion of the Birmingham contribution, which accounts for over 30 per cent of U.K. employment in Order IX, has significantly influenced the results with respect to Orders VII and IX.

Overall, about 1 out of every 250 manufacturing establishments in the UK was included in the General Survey—a 0.4 per cent sample. This is, however, not an accurate assessment of the size of the survey since the survey sample was biased towards large establishments. From the table below it can be seen that the size of sample expressed as a proportion of value of sales in manufacturing industry is considerably larger, at 1.6 per cent.

A similar check on the representativeness of the industrial distribution of the sample drawn for the Commodity Survey is not necessary as the industries covered by the sample were pre-

**Table 132: Value of sales of establishments in General Survey as a proportion of U.K. total value of sales**

| S.I.C. Order | Description                       | Value of Sales                          |  | Sample as % of total |
|--------------|-----------------------------------|---|--|----------------------|
|              |                                   | of all establishments in UK (£ million) | of establishments sampled for General Survey (£ million) |                      |
| III          | Food, drink, tobacco              | 5,300                                   | 30   | 0.6                  |
| IV           | Chemicals and allied industries   | 2,900                                   | 48   | 1.6                  |
| V            | Metal manufactures                | 2,700                                   | 15   | 0.6                  |
| VI           | Engineering and electrical goods  | 4,700                                   | 100  | 2.1                  |
| VII & IX     | Shipbuilding, metal goods, a.s.a. | 2,100                                   | 8  | 0.4                  |
| VIII         | Vehicles                          | 2,000                                   | 29   | 1.0                  |
| X-XII        | Textiles, leather goods, clothing | 3,300                                   | 96   | 2.9                  |
| XIII         | Bricks, pottery, cement, etc      | 800                                     | 15   | 1.9                  |
| XIV-XVI      | Timber, paper, other manufactures | 3,000                                   | 46   | 1.5                  |
|              | Total                             | 27,400                                  | 387  | 1.4                  |

Notes: (1) Value of sales are from the 1963 Census of Production.

(2) In some instances value of sales had to be estimated for establishments in the Survey.

selected and analysis is done on an industry basis. In terms of establishments in these five industries 6 per cent of the total number in the country were covered in the samples (see Table below). The exceptionally high proportion (10 per cent) of establishments drawn in the Iron and Steel and Electronics industries results from the large size of establishments in these industries and, therefore, the greater probability of their being drawn in a size biased sampling frame. Also because of the size bias the sample accounted for 26 per cent of the total value of sales of the industries covered by the Commodity Survey.

**Table 133: Comparison of Commodity Survey sample with UK population**

| Industry              | Total U.K.     |                     | Commodity Survey |                     | Sample as % of total U.K. |                |
|-----------------------|----------------|---------------------|------------------|---------------------|---------------------------|----------------|
|                       | Establishments | Value of Sales (£m) | Establishments   | Value of Sales (£m) | Establishments            | Value of Sales |
| Foodstuffs            | 1,594          | 550                 | 53               | 74                  | 3.3                       | 13.4           |
| Chemicals             | 1,222          | 822                 | 67               | 288                 | 5.5                       | 29.3           |
| Iron and Steel        | 512            | 1,350               | 54               | 559                 | 10.5                      | 38.5           |
| Electronics equipment | 712            | 470                 | 74               | 113                 | 10.4                      | 24.0           |
| Paper                 | 1,632          | 762                 | 113              | 164                 | 6.9                       | 21.6           |
| Total                 | 5,672          | 4,134               | 361              | 1,159               | 6.3                       | 28.0           |

Notes: (1) 1958 census figures have been used for number of establishments and 1963 census figures for value of sales.

(2) In some instances value of sales had to be estimated for establishments in the Survey.

<sup>2</sup> Use of the 1963 Census data would have been preferred but the full results of that census were not available at the time of writing. However, it is not believed that the use of figures that represent the pattern of industry eight years previously seriously affects the comparison except perhaps in Order VII—shipbuilding and marine engineering—which has been contracting in recent years.



# Questionnaire



Our reference:  
Your reference:

MINISTRY OF TRANSPORT  
St. Christopher House, Southwark Street, LONDON S.E.1  
Telex: 21352    Telegrams: Transministry London  
Telephone: WATKINS 3900, ext. 4701  
3280

Dear Sir,

## Survey of Transport from Manufacturing Establishments

The Ministry of Transport is carrying out a sample survey of transport from manufacturing establishments. This is a nation wide survey, and its aim is to compile information on the preferred methods of transport in different industries for different types of goods, sizes of consignments, etc. and on the factors which influence the choice between different forms of transport. Your establishment has been selected for inclusion in the sample and I would very much appreciate your assistance with the inquiry.

An interviewer ..... will be contacting you, by telephone or letter, during the month of September or October. I would be grateful if you could indicate to the interviewer the person in your firm who could best answer our questionnaire, so that an appointment can be made to call on him. The questionnaire will cover such aspects as the size and description of your own transport fleet and a breakdown of the methods of transport you use to carry goods from your establishment. We also wish to take some details from a sample of your consignment notes, and this will be further explained by the interviewer.

... For the present, I should be grateful if you would have the attached form (the purpose of which is to classify by size and type of business the establishments we shall be approaching) completed, and returned to Mr. S. L. Edwards, Statistics Division, Ministry of Transport, to whom any initial queries should also be addressed. A pre-paid envelope is enclosed.

... The information provided by you during this inquiry will be treated as strictly confidential, and will be used solely in the compilation of general statistical results. These will be prepared and published in a way which will not reveal the particulars relating to any individual undertaking unless the written consent of that undertaking has been asked for and has been given.

Thanking you in advance for your co-operation on this survey.

Yours faithfully,

A. H. Watson  
Director of Statistics



MINISTRY OF TRANSPORT

SURVEY OF TRANSPORT FROM MANUFACTURING ESTABLISHMENTS

Date \_\_\_\_\_  
 Name of Firm \_\_\_\_\_  
 Address \_\_\_\_\_  
 Telephone \_\_\_\_\_  
 Respondents' Name(s) \_\_\_\_\_  
 Position \_\_\_\_\_  
 Interviewer \_\_\_\_\_

OFFICE USE ONLY

Est.No. \_\_\_\_\_

Part 2 - Transport Usage

1. (i) Do you have any goods vehicles with 'C' licences (excluding those under 'O' hire arrangement) which are at the sole disposal of this establishment?

TICK BOX

|     |  |     |
|-----|--|-----|
| YES |  | - 1 |
| NO  |  |     |

IF YES - GO TO 1 (iii)

- (ii) IF NO - Do you have access to a pool of 'C' licence vehicles owned by your group?

TICK BOX

|     |  |     |
|-----|--|-----|
| YES |  | - 2 |
| NO  |  | - 3 |

IF YES, What is the address of the pool? \_\_\_\_\_

Col. 23

(iii) How many 'C' licence vehicles do you have, analysed by weight and type? FILL IN BELOW.

(NOTE: (a) Weight of articulated vehicles  
= drawing unit  
+ semi-trailer

(b) Quantity of vehicles in fleet  
(excludes additional trailers)

| Type of Body                          | Gross Weight  |                        |                        |                        |             | Total |            |
|---------------------------------------|---------------|------------------------|------------------------|------------------------|-------------|-------|------------|
|                                       | 2 tons & less | over 2 not over 3 tons | over 3 not over 5 tons | over 5 not over 8 tons | over 8 tons |       |            |
| Tipper                                |               |                        |                        |                        |             |       | Qals 24-26 |
| Platform                              |               |                        |                        |                        |             |       | Qals 27-29 |
| Boxbody with special fittings         |               |                        |                        |                        |             |       | Qals 30-32 |
| Boxbody without special fittings      |               |                        |                        |                        |             |       | Qals 33-35 |
| Tanker (liquids)                      |               |                        |                        |                        |             |       | Qals 36-38 |
| Tanker or other bulk carrier (solids) |               |                        |                        |                        |             |       | Qals 39-41 |
| Insulated or refrigerated van         |               |                        |                        |                        |             |       | Qals 42-44 |
| Other                                 |               |                        |                        |                        |             |       | Qals 45-47 |
| TOTAL                                 |               |                        |                        |                        |             |       |            |
|                                       | Qals 48-50    | Qals 51-53             | Qals 54-56             | Qals 57-59             | Qals 60-62  |       |            |

2. (1) Does this establishment use any goods vehicles with 'B' licences? **ENTER ONE.**

|     |     |
|-----|-----|
| YES | = 1 |
| NO  | = 2 |

Col 65

- (2) IF YES - How many 'B' licence vehicles analysed by weight and type? **FILL IN BELOW.**

(NOTE: (a) Weight of articulated vehicles  
= drawing unit  
+ semi-trailer

(b) Quantity of vehicles in fleet  
excludes additional trailers)

| Type of Body                                | Trailer Weight   |                              |                               |                                |                 | Total |                |
|---|------------------|------------------------------|-------------------------------|--------------------------------|-----------------|-------|----------------|
|   | 2 tons<br>& less | over 2<br>not over<br>5 tons | over 5<br>not over<br>10 tons | over 10<br>not over<br>15 tons | over<br>15 tons |       |                |
| Tipper                                      |                  |                              |                               |                                |                 |       | Col 66-66      |
| Platform                                    |                  |                              |                               |                                |                 |       | Col 67-69      |
| Boxbody with<br>special fittings            |                  |                              |                               |                                |                 |       | Col 70-72      |
| Boxbody without<br>special fittings         |                  |                              |                               |                                |                 |       | Col 73-75      |
| Tanker (liquids)                            |                  |                              |                               |                                |                 |       | Col 76-78      |
| Tanker or other<br>bulk carrier<br>(solids) |                  |                              |                               |                                |                 |       | *<br>Col 79-81 |
| Insulated or<br>refrigerated van            |                  |                              |                               |                                |                 |       | Col 82-84      |
| Other                                       |                  |                              |                               |                                |                 |       | Col 85-87      |
| TOTAL                                       |                  |                              |                               |                                |                 |       |                |

Col  
14-16Col  
17-19Col  
20-22Col  
23-25Col  
26-28

\* Card No. 2/Col 1  
Report Col 2-4

3. (i) Do you have any goods vehicles available for use by this establishment under 'A Contract' licences? **Y/NK NOK**

|     |     |
|-----|-----|
| YES | = 1 |
| NO  | = 2 |

Col 29

- (ii) IF YES - How many 'A Contract' vehicles analysed by weight and type? **Fill in BELOW**

(NOTE: (a) Weight of articulated vehicles  
= drawing unit  
+ semi-trailer

(b) Quantity of vehicles in fleet  
(includes additional trailers)

| Type of Body                          | Delivered Weight |                        |                        |                        |             | Total |  |           |
|---------------------------------------|------------------|------------------------|------------------------|------------------------|-------------|-------|--|-----------|
|                                       | 2 tons & less    | over 2 not over 3 tons | over 3 not over 5 tons | over 5 not over 8 tons | over 8 tons |       |  |           |
| Tipper                                |                  |                        |                        |                        |             |       |  | Col 30-32 |
| Platform                              |                  |                        |                        |                        |             |       |  | Col 33-35 |
| Boxbody with special fittings         |                  |                        |                        |                        |             |       |  | Col 36-38 |
| Boxbody without special fittings      |                  |                        |                        |                        |             |       |  | Col 39-41 |
| Tanker (liquids)                      |                  |                        |                        |                        |             |       |  | Col 42-44 |
| Tanker or other bulk carrier (solids) |                  |                        |                        |                        |             |       |  | Col 45-47 |
| Insulated or refrigerated van         |                  |                        |                        |                        |             |       |  | Col 48-50 |
| Other                                 |                  |                        |                        |                        |             |       |  | Col 51-53 |
| TOTAL                                 |                  |                        |                        |                        |             |       |  |           |
|                                       | Col 54-56        | Col 57-59              | Col 60-62              | Col 63-65              | Col 66-68   |       |  |           |

4. (a) Do you have an arrangement for hiring goods vehicles under a 'G hire' licence? TICK BOX

|     |     |
|-----|-----|
| YES | = 1 |
| NO  | = 2 |

5-

Col 69-

IF NO, GO TO QUESTION 5

- (ii) For how many goods vehicles do you have a 'G hire' arrangement?

|        |  |  |  |
|--------|--|--|--|
| NUMBER |  |  |  |
|--------|--|--|--|

Cols 70-72

- (iii) How many 'G hire' vehicles are you using today (i.e. day of filling in questionnaire), analysed by weight and type? FILL IN BELOW.

(NOTE: (a) Weight of articulated vehicles  
= drawing unit  
+ semi-trailer

(b) Quantity of vehicles in fleet  
excludes additional trailers)

| Type of Body                          | Unladen Weight |                        |                        |                        |             | Total |           |
|---------------------------------------|----------------|------------------------|------------------------|------------------------|-------------|-------|-----------|
|                                       | 2 tons & less  | over 2 not over 3 tons | over 3 not over 5 tons | over 5 not over 8 tons | over 8 tons |       |           |
| Tipper                                |                |                        |                        |                        |             |       | Col 73-75 |
| Platform                              |                |                        |                        |                        |             |       | Col 76-78 |
| Boxbody with special fittings         |                |                        |                        |                        |             |       | Col 79-81 |
| Boxbody without special fittings      |                |                        |                        |                        |             |       | Col 82-84 |
| Tanker (liquids)                      |                |                        |                        |                        |             |       | Col 85-87 |
| Tanker or other bulk carrier (solids) |                |                        |                        |                        |             |       | Col 88-90 |
| Insulated or refrigerated van         |                |                        |                        |                        |             |       | Col 91-93 |
| Other                                 |                |                        |                        |                        |             |       | Col 94-96 |
| TOTAL                                 |                |                        |                        |                        |             |       |           |
|                                       | Col 25-25      | Col 26-28              | Col 29-31              | Col 32-34              | Col 35-37   |       |           |

|            |         |       |
|------------|---------|-------|
| * Card No. | 1       | Col 1 |
| Repeat     | Col 2-4 |       |

5. (i) Are there any railway wagons at the sole disposal of this establishment which are owned or hired (under contract of 3 months or longer)?  
TICK BOX

|     |  |     |
|-----|--|-----|
| YES |  | = 1 |
| NO  |  | = 2 |

Col 38

- (ii) IF YES - How many are owned or hired?

|             |  |  |  |  |
|-------------|--|--|--|--|
| TICKS OWNED |  |  |  |  |
|-------------|--|--|--|--|

Cols 39-42

|             |  |  |  |  |
|-------------|--|--|--|--|
| TICKS HIRED |  |  |  |  |
|-------------|--|--|--|--|

Cols 43-46

6. (i) Has this establishment a rail siding connected to the British Rail system?  
TICK BOX

|     |  |     |
|-----|--|-----|
| YES |  | = 1 |
| NO  |  |     |

- (ii) IF YES - Is it used for:

|               |  |     |
|---------------|--|-----|
| dispatch only |  | = 2 |
| receipts only |  | = 3 |
| both          |  | = 4 |
| not in use    |  | = 5 |

Col 47

TICK BOX

7. (i) Is this establishment served by its own berths for canal or sea-going vessels?  
TICK BOX

|     |  |     |
|-----|--|-----|
| YES |  | = 1 |
| NO  |  |     |

- (ii) IF YES - Are they used for:

|               |  |     |
|---------------|--|-----|
| dispatch only |  | = 2 |
| receipts only |  | = 3 |
| both          |  | = 4 |
| not in use    |  | = 5 |

Col 48

TICK BOX



2. (i) What was the tonnage of (a) outgoing goods (b) outgoing and incoming goods carried on your own transport from this establishment in 1965 (or last financial year)? 7.
- (ii) What was the cost of operating your own transport in 1965 (or last financial year)?

|                            | (i)(a)<br>OUTGOING TONS | (i)(b) RETURNING<br>& INCOMING TONS | (ii) £ COST          |                 |
|----------------------------|-------------------------|-------------------------------------|----------------------|-----------------|
| Own road vehicles          | <input type="text"/>    | <input type="text"/>                | <input type="text"/> | Cols 43-49      |
| Own coastal, canal vessels | <input type="text"/>    | <input type="text"/>                | <input type="text"/> | Cols 70-76*5-18 |
| TOTAL OWN TRANSPORT        | <input type="text"/>    | <input type="text"/>                | <input type="text"/> | Cols 19-39      |

\* Card No.   
Col 1. Export  
Cols 2-6

- (iii) What was the tonnage of outgoing goods carried by other transport organisations from this establishment in 1965 (or last financial year)?
- (iv) What were the total payments to other organisations for the transport of outgoing goods in 1965 (or last financial year)?

|  | (iii) TONS           | (iv) £ COST          |                 |
|--|----------------------|----------------------|-----------------|
| Outside road hauliers                  | <input type="text"/> | <input type="text"/> | Cols 40-53      |
| Customs collection                     | <input type="text"/> | <input type="text"/> | Cols 54-59      |
| British Rail                           | <input type="text"/> | <input type="text"/> | Cols 60-73      |
| Outside coastal, canal vessels         | <input type="text"/> | <input type="text"/> | Cols 74-80*5-11 |
| G.P.O.                                 | <input type="text"/> | <input type="text"/> | Cols 12-21      |
| Others (specify <input type="text"/> ) | <input type="text"/> | <input type="text"/> | Cols 22-31      |
| TOTAL, OUTSIDE TRANSPORT               | <input type="text"/> | <input type="text"/> | Cols 32-45      |

\* Card No.   
Col 1. Export  
Cols 2-6

- (v) TOTAL, ALL TRANSPORT

| (v) TONS             | (v) £                |            |
|----------------------|----------------------|------------|
| <input type="text"/> | <input type="text"/> | Cols 46-50 |

- (NOTES)**
- Own road vehicles - 'D', 'D hire', and own 'D' licences. Outside hauliers - 'A', 'A contract' and their 'B' licences.
  - Tonnage should include normal packing, but exclude pallets or containers.
  - Include work put out for processing.
  - Exports - count only method and cost of transport to port of exit.
  - Own fleet costs - include direct transport costs (labour, running costs, repairs, maintenance, depreciation etc.) Exclude capital expenditure. Exclude passenger cars.
  - Outside transport - exclude storage and auxiliary service costs. Exclude letters from G.P.O. if possible.
  - Include hire charges but not hire-purchase.
  - Please estimate if actual figures not available.

9. (IF YOUR MAIN FORM OF TRANSPORT IS PUBLIC ROAD HAULING OTHER THAN UNDER UNDER 'A' CONTRACT)

(1) Do you always employ the same ones? TICK BOX

|   |  |     |
|---|--|-----|
| PUBLIC HAULING NOT MAIN FORM OF TRANSPORT |  | = 1 |
| YES                                       |  | = 2 |
| NO  |  | = 3 |

Col 60

(11) IF NO - What is the reason for this?

COMMENT: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

10. (IF YOUR MAIN FORM OF TRANSPORT IS YOUR OWN ROAD PLANT)

(1) Do you have sufficient capacity to meet upward fluctuations in demand? TICK BOX

|   |  |     |
|---|--|-----|
| OWN ROAD PLANT NOT MAIN FORM OF TRANSPORT |  | = 1 |
| YES                                       |  | = 2 |
| NO  |  |     |

Col 61

(11) IF NO - Do you use public operations (either road or rail) to meet upward fluctuations in demand?

TICK BOX

|     |  |     |
|-----|--|-----|
| YES |  | = 3 |
| NO  |  | = 4 |

11. Is the decision as to the mode of transport used made at this establishment? TICK BOX

|     |  |     |
|-----|--|-----|
| YES |  | = 1 |
| NO  |  | = 2 |

Col 62

12. (i) Do any of the following factors influence you in deciding which modes of transport to use mainly?

|     |     |
|-----|-----|
| YES | = 1 |
| NO  | = 2 |

Col 63

- (ii) IF YES - Can you pick the two which are most important to you, and rank them in order? PUT THE NUMBERS OF YOUR FIRST AND SECOND CHOICES IN THE CORRESPONDING BOXES.

1. Ready availability when required
2. Speed of delivery (to meet customer's requirements)
3. " " " (to get quick turnaround of vehicles)
4. " " " (to keep stock levels low)
5. Good record with respect to damage
6. " " " " " loss

|             |  |
|-------------|--|
| 1st CHOICE: |  |
| 2nd CHOICE: |  |

Col 64

Col 65

13. (i) Has any major change occurred in the last two years in the mode of transport you use? TICK BOX

|     |     |
|-----|-----|
| YES | = 1 |
| NO  | = 2 |

Col 66

(NOTE: A major change is defined as a switch of 5% or more of your total tonnage from one mode to another - modes defined as each type of road vehicle licence, rail, ship, post etc.)

- (ii) IF YES - What was the nature of and reasons of this change?

COMMENT: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

14. (i) Do you plan any major change in modes of transport in the future ? TICK BOX

|     |  |     |
|-----|--|-----|
| YES |  | = 1 |
| NO  |  | = 2 |

Col 67

- (ii) IF YES - What will be the nature of and reasons for this change ? COMMENT: \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

THE FOLLOWING QUESTIONS SHOULD BE FILLED IN AFTER COMPLETION OF THE WEEK OF SAMPLING CONSIGNMENT NOTES.

15. What was the total quantity of consignments from this establishment during the week of sampling ?

|  |
|--|
|  |
|--|

16. (i) Were any of the consignments picked for the sample lost en route ?

|     |  |
|-----|--|
| YES |  |
| NO  |  |

- (ii) IF YES - Which ones ? (GIVE CONSIGNMENT NOTE NUMBERS OR ANY OTHER METHOD OF IDENTIFICATION WHICH WILL HAVE APPEARED ON THE CONSIGNMENT QUESTIONNAIRE) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

CNP/ts  
3.6.66.



## TO BE COMPLETED BY SENDER OF GOODS

1. Name/address of sender's firm: \_\_\_\_\_
2. Establishment no:    3. Firm's consignment no: \_\_\_\_\_
4. This is the    th consignment in the sample

TO THE RECEIVER OF GOODS AT FINAL DESTINATION OR (FOR EXPORTS) AT PORT OF EXIT. This is part of a nationwide survey of transport of industrial goods which is being carried out by the Ministry of Transport. We would be very grateful if you would complete the following details about this particular consignment as soon as it arrives and post the pre-paid card.

1. Date of receipt of this consignment: \_\_\_\_\_
2. Is the consignment damaged? I. Yes ☐ II. No ☐
3. Will you claim insurance/compensation? I. Yes ☐ II. No ☐

THANK YOU



## MINISTRY OF TRANSPORT

B- Christopher House, Southwark Street, LONDON S.E.1

Telex: 21352 Telegram: Transmivory London

Telephone: Waterloo 7999, ext. 2906

Our reference:  
Your reference:

Dear

Recently you were extremely helpful in providing us with information on consignments shipped from your firm. The response to this survey has been very high, and we are analysing the data in order to calculate the relative importance of factors determining the demand for freight transport. An important factor determining choice of mode is the cost of other forms of transport, and we are carrying out a survey of a sub-sample of consignments in order to obtain information on this.

We would be very grateful if you could give on the attached sheet your estimate of the costs of the alternative modes of transport for the consignments listed, details of which are enclosed. We appreciate that in many cases alternatives will be cheaper but will not have the same standard of service as your chosen mode. If you have not estimated the costs of alternatives because you would not consider making them whatever the cost please fill in 'not estimated'; we are not asking you to make special enquiries to establish these alternative costs.

It would be appreciated if you could return the form as soon as possible and in any case not later than 7th July, 1967.

Yours faithfully,

A. H. WATSON  
Director of Statistics



## The probability model

It was considered that the most convenient way of handling such large numbers of observations and variables was by the use of multiple regression in a discriminant manner. The regressand is treated as a dummy variable taking on the value of 1 if an event occurs and a value of 0 if it does not, and this is treated as a function of the selected regressor variables. Where one is attempting to discriminate between the use of transport on own account and professional operators the function would be:

$$Y = f(X_1, X_2, \dots, X_n)$$

where:  $Y =$  1 consignment went by transport on own account  
0 consignment did not go by transport on own account

$X_1, \dots$  = explanatory variables.

The calculated value of  $Y$  is then interpreted as the conditional probability that the consignment will go by transport on own account given the  $X$ 's.<sup>2</sup>

A number of authors commenting on this type of probability model have either suggested or employed a constraint on the co-efficients so that they cannot sum to more than 1. The theoretical case for such an approach is, however, doubtful. In an unconstrained model a number of combinations of variables might result in certainty, in a constrained model only a combination of all variables would lead to certainty. The constraint, therefore, takes away from the importance of all the variables and reaches the very unrealistic assumption that only a combination of all variables can lead to certainty. In the models below no constraint has been applied; and in cases, for example, where a combination of 3 out of 4 relevant variables have co-efficients that sum to 1 the addition of the fourth (positive) variable is to be interpreted as having no effect on a situation where certainty already attains.

The variables that were used in the analysis are listed below:

### Factors relating to consignments

- (1) Length of haul (miles)
- (2) Journey time (days)
- (3) Charge (pence)
- (4) Consignment weight (lbs)
- (5) Regularity of shipment
- (6) Container used

- (7) Special body required
- (8) Inter-establishment move
- (9) Consignment required more urgently than usual
- (10) Ancillary service performed
- (11) Type of commodity
- (12) Destination

### Factors relating to firm

- (13) Origin
- (14) Size of firm
- (15) Ownership of rail siding
- (16) Ownership of 'C' licence vehicles (or use of pool)
- (17) Vehicles under 'A contract.'

### Subjective assessments

- (18) Knowledge of charge by alternative mode
- (19) Charge by alternative mode
- (20) Speed required to meet customers' requirements
- (21) Speed required to ensure high utilisation of vehicles
- (22) Speed required to maintain low stock levels
- (23) Ready availability of vehicles
- (24) Freedom from loss
- (25) Freedom from damage.

The continuous variables—length of haul, journey time, weight and charge (1–4)—were entered as logarithmic values as it was considered that the probability function with respect to these variables was non-linear. The other variables were entered as dummies and are defined below:

### Regularity

Only regular and irregular traffic were differentiated; shipments taking place at intervals of less than one month being regarded as regular and greater than one month as irregular.

### Variables 6–10

These variables are self explanatory and relate to whether these particular factors pertained to a consignment or not; in the case of an ancillary service only the existence of such a service was taken into account, the different types of service were not differentiated.

### Type of commodity

Thirteen commodity groups were differentiated: raw foodstuffs; manufactured foodstuffs; coal and oil; iron scrap; iron and steel; chemicals; building materials; transport vehicles and equipment; electrical goods; non-ferrous metals; metal manufacture; other manufactures; miscellaneous.

<sup>2</sup> One of the problems of using a dichotomous regressand is that the error term is heteroscedastic. Professor Goldberger has suggested a two stage method for correcting for this (see *Econometric Theory* p. 249), but the bias was considered so small as not to warrant such an expensive procedure. Other authors using this method have also taken this view and have made no correction in their work.



## Origin and destination

These were confined to the ten Planning Regions. Due to the large number of variables already in the model combinations of origins and destinations could not be used. This meant that in some instances the influence of this variable on the distribution of traffic between modes would be lost, or if a particular mode specialises in traffic on high density routes and another on low density routes this influence will be lost where the origin is an industrial region and the destination a development region or vice versa.

## Size of firm

These size groups were differentiated on the basis of members employed: (1) 11-99 employees; (2) 100-499 employees; (3) 500 and over employees.

## Variables 15-17

These denote solely whether or not the firm has these facilities at its disposal.

## Knowledge of charge by alternative mode

This denoted only whether the shipper knew the charge of sending the consignment by an alternative mode.

## Charge by alternative mode

This is what the shippers thought would be the charge of sending the consignment by a suitable alternative mode. Its treatment in the model is discussed later.

## Variables 20-25

These denote whether or not the shipper considered these factors important in determining his choice of mode. First and second choices were not differentiated.

The inclusion of so many regressor variables could tend to unreliability in the estimators even with so many degrees of freedom; on a priori grounds it was difficult to reject any, but the use of a 5 per cent level of significance ensured that a large number of variables would not enter into the final calculations of the estimators in the step-wise regression.

Details of the various models are given in the following paragraphs.

## Transport on own account/Professional transport

The first run of the general survey data included all the variables except variable 20 (charge by alternative mode). It showed that Journey Time and Knowledge of Charges by Alternative Modes were not significant in discriminating between these two modes, and that a high degree of multicollinearity existed between Charges and Consignment Weight (zero-order correlation co-efficient: 0.85). It was decided, therefore, to do two re-runs of the data: firstly, to re-run the model excluding journey time, knowledge of charges by alternative modes and charge—this meant that the model would be based upon a far larger number of observations,<sup>1</sup> a factor which is very important to ensure accuracy when estimators are based upon the means of cells as in this case. Secondly, to attempt to obtain further information on the influence of price. The significant co-efficients and their standard errors for the first of these two runs are given below:

$$Y = \begin{matrix} 1 & \text{Transport on own account} \\ 0 & \text{Transport not on own account.} \end{matrix}$$

| Constant                              | 0.53  |         |
|---------------------------------------|-------|---------|
| (1) Haul                              | -0.34 | (0.005) |
| (4) Weight                            | 0.08  | (0.004) |
| (5) Regularity                        | 0.12  | (0.009) |
| (6) Consignment                       | -0.21 | (0.011) |
| (7) Special body                      | 0.14  | (0.020) |
| (8) Lorry                             | 0.48  | (0.005) |
| (10) Foodstuffs (manufactured)        | 0.03  | (0.008) |
| (11) Iron scrap                       | -0.06 | (0.031) |
| (12) Transport vehicles and equipment | 0.12  | (0.006) |
| (13) Non-ferrous metals               | 0.16  | (0.020) |
| (14) Destination (East Midlands)      | 0.14  | (0.014) |
| (15) Destination (South East)         | 0.05  | (0.008) |
| (17) Destination (Scotland)           | 0.04  | (0.015) |
| (18) Origin (North-east)              | 0.19  | (0.022) |
| (19) Origin (Yorkshire)               | -0.06 | (0.012) |
| (19) Origin (South Eastern)           | 0.08  | (0.017) |
| (19) Origin (North Western)           | 0.05  | (0.013) |
| (14) Size (2)                         | 0.06  | (0.010) |
| (14) Size (3)                         | 0.03  | (0.013) |
| (15) Sliding                          | -0.22 | (0.025) |
| (16) Own vehicles                     | 0.16  | (0.015) |
| (17) 'A contract' vehicles            | -0.10 | (0.012) |
| (20) Turn-round speed                 | -0.27 | (0.033) |
| (23) Speed to maintain low stocks     | -0.20 | (0.008) |
| (25) Ready availability               | 0.08  | (0.013) |
| (24) Freedom from loss                | -0.16 | (0.015) |

R 0.64

Overall nearly one-half of the consignments in the General Survey went by transport on own account, but if, for instance, we assumed that a consignment of iron-scrap weighing 12 tons were shipped 75 miles from a medium sized firm with its own vehicle fleet and where none of the other significant variables was pertinent, the probability of it going on own account would be:

$$P = 0.53 - 0.08 + 0.09 - 0.64 + 0.06 + 0.16 - 0.12 \\ (\text{constant}) (\text{iron-}) (\text{weight}) (\text{haul}) (\text{medium}) (\text{own}) \\ (\text{scrap}) (\text{firm}) (\text{fleet})$$

The probability of it going by professional transport is, of course, 0.88 (the co-efficients take the opposite signs and the intercept becomes 0.47).

An important assumption made in the analysis is the one concerning the shape of the functions relating length of haul and consignment weight with the distribution of consignments between modes. When the regressor variable is a dummy in this type of analysis the regression 'line' is fitted to only two points thus the sum of squares is minimised at both these points. This being the case the estimated conditional probabilities are accurate for all (ie two) observations. On the other hand when the regressor variable is continuous the sum of squares is minimised over all observations and not at each point, thus the estimated probability function is only an approximation to the true one.<sup>2</sup>

Budget constraints did not allow experimentation with different types of model, but in order to test the accuracy of the a priori assumptions on the shape of the probability function

<sup>1</sup> Information on these factors was only obtained for about 25% of the total number of consignments (see p. 128).

<sup>2</sup> This is, of course, true of any regression based on least squares irrespective of a dichotomous regressand. It is, however, important to remember this fact in the discussion which follows.

the results of the first step of the regression analysis (ie the introduction of length of haul) can be tested against the actual distribution of consignments between modes according to length of haul.

The estimating equation is:

$$P(\text{transport on own account}) = 1.12 - 0.43 (\log \text{haul})$$

In order to test this against Table 1 (which is reproduced below) certain assumptions had to be made about the distribution of consignments within the class intervals of the table. Ideally the classes are arranged so that observations are distributed normally within them; when, however, it is necessary to compare several distributions in the same table the fixing of class intervals is more difficult.

Table 1: Share of each mode in total consignments in each distance bracket

|                |               | Percentages       |                        |      |     |                    |                               |
|----------------|---------------|-------------------|------------------------|------|-----|--------------------|-------------------------------|
|                |               | Mode of transport |                        |      |     |                    | No. of consignments in survey |
|                |               | Own road          | Road (vehicle haulier) | Rail | GPO | Other <sup>a</sup> |                               |
| Length of haul | Over Not over |                   |                        |      |     |                    |                               |
|                | 25 miles      | 82                | 8                      | 1    | 6   | 3                  | 100                           |
| 25             | 50 miles      | 58                | 16                     | 9    | 16  | 1                  | 100                           |
| 50             | 100 miles     | 29                | 33                     | 13   | 24  | 1                  | 100                           |
| 100            | 200 miles     | 18                | 33                     | 23   | 23  | 1                  | 100                           |
| 200            | 225 miles     | 16                | 33                     | 26   | 24  | 1                  | 100                           |
| All lengths    |               | 48                | 32                     | 12   | 16  | 2                  | 100                           |
|                |               |                   |                        |      |     |                    | 64,330                        |

Source: General Survey

<sup>a</sup>Includes customer collection, coastal shipping, inland waterway, domestic air transport.

In the lowest class, for instance, it is very reasonable to assume that transport on own account observations will be peaked fairly near the lower boundary whilst the professional operator observations are normally distributed within the class. This argument is further supported by the comparatively large positive intercept in the above equation. As one-third of all consignments fall in this lower class one would expect a negative intercept, the positive one indicates that a very substantial proportion of these (and 82 per cent of the total are shipped on own account) must be near the lower boundary. In the highest class one would also expect the transport on own account observations to be nearer the lower boundary (200 miles) than the professional carrier observations. If one assumed that for the lowest class the pertinent distance were 5 miles and for the highest classes 225 miles with the observations normally distributed in the remaining classes the estimated and actual probabilities are as in the table.

Estimated and actual proportions of consignments shipped on own account for various lengths of haul

| Haul (miles) | Estimated percent | Actual percent |
|--------------|-------------------|----------------|
| 5            | 82                | 82             |
| 37½          | 44                | 58             |
| 75           | 31                | 29             |
| 150          | 18                | 18             |
| 225          | 12                | 16             |

The estimated and actual probability functions are very similar; the discrepancy in the second class is probably caused to some extent by a skewed distribution, but it is possible that a logistic or third degree parabola type of function might have given a slightly better fit. We are, however, not interested in this relationship, but in a relationship where length of haul is considered other things being equal. As consignment weight is the only other variable which is more than marginally significant it is possible to take account of this by considering length of haul for consignments of specific weights. Graph 24 is based upon Table 5, p. 26 and it can be seen that except for the weight size  $\frac{1}{2}$  ton-7½ tons there is no evidence of a slower rate of change over the lower ranges than the middle ones. It can be concluded, therefore, that the correct type of probability function was fitted.

The assumptions about the function relating consignment weight and the proportion of consignments shipped on own account can be tested with reference to graph 25 which is based upon Table 5. There is no very clear relationship here. The proportions for all lengths of haul increase up to about  $\frac{1}{2}$  ton but there is no common relationship beyond this point.

#### Influence of price

In order to obtain information on the elasticity of substitution it was decided to introduce the ratio cost by transport on own account/charge by professional operator into the model. One of the difficulties of doing this was the low number of observations on charges by alternative modes, and even where shippers using professional operators had given alternative charges they had often not given transport on own account as an alternative. As length of haul and consignment weight were overpowering the most important variables in the previous analysis it was decided to run the model with only these two variables plus the price ratio in order to keep the number of observations as high as possible.

This model worked very well with no multi-collinearity; with the error term behaving well (no specification bias); and with the co-efficients similar to that in the previous model.<sup>1</sup>

$$Y = \begin{matrix} 1 & \text{transport on own account} \\ 0 & \text{transport not on own account} \end{matrix}$$

|             |       |         |
|-------------|-------|---------|
| Constant    | 0.65  |         |
| Haul        | -0.29 | (0.043) |
| Weight      | 0.10  | (0.017) |
| Price ratio | -0.05 | (0.015) |

The relevant point elasticity at the point of means is:

$$\frac{\frac{\partial P}{\partial R}}{\frac{\partial R}{\partial P}} = -0.21$$

where: P = conditional probability  
R = Price ratio.

<sup>1</sup> There is, of course, no need for the co-efficients to be the same, for, as was argued in the text, the consignments where an alternative charge is known are likely to be different in character from those where an alternative charge is not known.

# **Road Haulier/Transport on own account**

This model was identical in form to the previous general model except that variable 15 (Private siding) was omitted, and the significant co-efficients and their standard errors are listed below:

$$Y = \frac{1}{0} \text{ road haulier} \\ \text{transport on own account.}$$

| Constant                             | 0.15  |         |
|--------------------------------------|-------|---------|
| (1) Haul                             | 0.33  | (0.009) |
| (2) Regularity                       | -0.12 | (0.011) |
| (3) Consistent                       | 0.01  | (0.013) |
| (4) Special body                     | -0.12 | (0.030) |
| (5) Urgency                          | -0.29 | (0.012) |
| (6) Auxiliary service                | 0.05  | (0.023) |
| (7) Roadworth                        | -0.27 | (0.010) |
| (8) Transport vehicles and equipment | -0.14 | (0.021) |
| (9) Non-ferrous metals               | -0.21 | (0.015) |
| (10) Destination (East Midlands)     | -0.15 | (0.018) |
| (11) Destination (South Eastern)     | -0.04 | (0.013) |
| (12) Origin (Yorkshire)              | 0.14  | (0.013) |
| (13) Origin (East Midlands)          | 0.07  | (0.013) |
| (14) Origin (South Eastern)          | -0.12 | (0.016) |
| (15) Sex (1)                         | 0.06  | (0.013) |
| (16) Own vehicles                    | -0.22 | (0.021) |
| (17) 'A contract' vehicles           | 0.14  | (0.014) |
| (18) Turn-round speed                | 0.22  | (0.025) |
| (19) Speed to maintain low stocks    | 0.20  | (0.029) |
| (20) Ready availability              | 0.05  | (0.005) |
| (21) Freedom from loss               | 0.27  | (0.030) |

R 0.62

It is again possible to test the assumption of the form of the function relating the proportion of consignments shipped by road haulier and length of haul. The first step of the regression gave the following equation:

$$F(\text{road haulier}) = -0.20 + 0.41(\log \text{haul})$$

In the table below the estimated and actual proportions are given based upon the same assumptions of class distribution as in the section above.

| Haul (miles) | Estimated per cent | Actual per cent |
|--------------|--------------------|-----------------|
| 5            | 9                  | 9               |
| 37½          | 44                 | 22              |
| 75           | 57                 | 53              |
| 150          | 69                 | 66              |
| 225          | 76                 | 67              |

There is again a discrepancy at the bottom end of the distribution, but when consignment weight is held constant as in Graph 26 this is not so apparent and it would appear that the correct type of function was fitted.

The influence of consignment weight on the distribution of traffic with haul held constant is illustrated in Graph 27. Again no clear relationship is apparent and there is little reason to suppose that a different type of function would have given a better approximation.

## **Road Haulier/Transport on own account (Paper)**

This model was similar in form to the previous one except that it was confined to consignments of Paper in the Commodity Survey; the variable length of haul was also replaced by a dummy variable (local delivery) denoting hauls above and below 25 miles in order to try and arrive at a mileage cut-off point.

$$Y = \frac{1}{0} \text{ road haulier} \\ \text{transport on own account.}$$

| Constant                      | 1.37  |         |
|-------------------------------|-------|---------|
| (1) Local delivery            | -0.38 | (0.008) |
| (2) Weight                    | -0.01 | (0.008) |
| (3) Auxiliary service         | -0.51 | (0.015) |
| (4) Destination (Northern)    | 0.17  | (0.012) |
| (5) Destination (Yorkshire)   | -0.08 | (0.032) |
| (6) Destination (South East)  | -0.04 | (0.017) |
| (7) Destination (South West)  | 0.07  | (0.017) |
| (8) Origin (East Midlands)    | -0.25 | (0.046) |
| (9) Origin (East Angles)      | 0.30  | (0.042) |
| (10) Origin (South East)      | 0.05  | (0.029) |
| (11) Origin (West Midlands)   | -0.40 | (0.011) |
| (12) Origin (Scotland)        | 0.32  | (0.014) |
| (13) Sex (1)                  | 0.09  | (0.019) |
| (14) Sex (2)                  | -0.22 | (0.014) |
| (15) Own vehicles             | -0.54 | (0.021) |
| (16) 'A contract' arrangement | 0.16  | (0.022) |
| (17) Ready availability       | -0.07 | (0.025) |
| (18) Freedom from damage      | -0.22 | (0.027) |

R = 0.64

A constant term of greater than 1 results from a shortage of low value observations in an 8 dimensional space. It would have been possible to have overcome this by the use, for example, of a logistic function, but this would have indicated that reliance could be placed on the results obtained from the use of extreme values in the model—any modification was, therefore, rejected.

## **Road haulier/Transport on own account (Chemicals)**

The form of this model is similar to that for Paper (above), and is based upon consignments of chemicals in the Commodity Survey. The results under column 1 relate to the use of *local delivery* as a dummy variable, and those under column 2 to *length of haul* as a continuous variable.

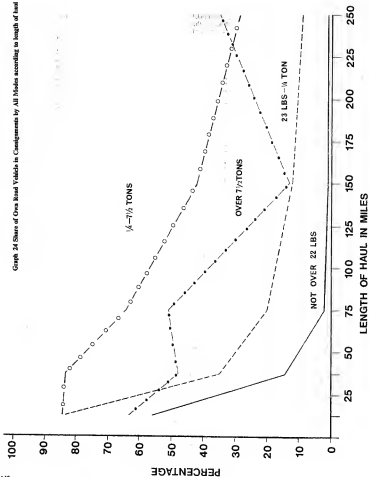
$$Y = \frac{1}{0} \text{ road haulier} \\ \text{transport on own account.}$$

| Constant                         | 0.49  |         | 0.90  |         |
|----------------------------------|-------|---------|-------|---------|
| (1) Local delivery (haul)        | -0.19 | (0.017) | 0.18  | (0.017) |
| (2) Weight                       | 0.01  | (0.009) | 0.01  | (0.009) |
| (3) Regularity                   | -0.19 | (0.014) | -0.19 | (0.014) |
| (4) Consistent                   | 0.07  | (0.022) | 0.07  | (0.022) |
| (5) Special body                 | -0.16 | (0.026) | -0.15 | (0.026) |
| (6) Inter-establishment moves    | 0.07  | (0.025) | 0.16  | (0.026) |
| (7) Urgency                      | -0.14 | (0.020) | -0.13 | (0.020) |
| (8) Auxiliary service            | -0.16 | (0.020) | -0.21 | (0.020) |
| (9) Destination (Yorkshire)      | -0.15 | (0.021) | -0.08 | (0.021) |
| (10) Destination (East Midlands) | -0.29 | (0.014) | -0.24 | (0.015) |
| (11) Destination (West Mid.)     | -0.12 | (0.012) | -0.08 | (0.012) |
| (12) Origin (Northern)           | 0.25  | (0.020) | 0.23  | (0.020) |
| (13) Origin (North Western)      | 0.29  | (0.020) | 0.19  | (0.020) |
| (14) Own vehicles                | -0.33 | (0.014) | -0.33 | (0.015) |
| (15) 'A contract' arrangement    | 0.15  | (0.017) | 0.14  | (0.018) |
| (16) Ready availability          | 0.13  | (0.041) | 0.13  | (0.043) |
| (17) Freedom from damage         | 0.23  | (0.040) | 0.28  | (0.046) |

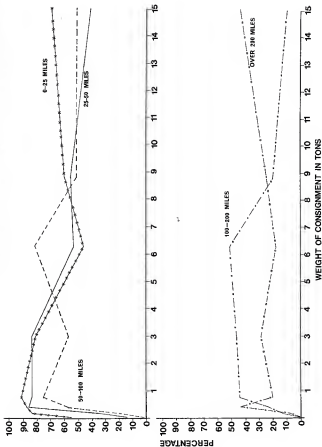
R = 0.65

R = 0.64

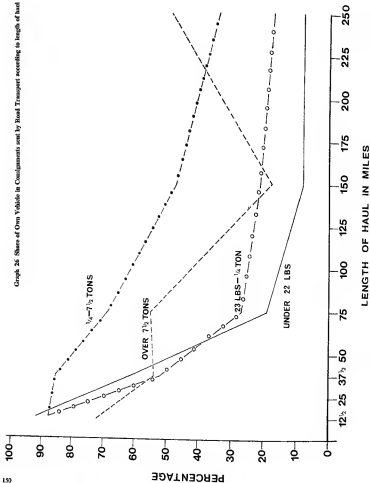
Graph 24 Share of Over Road Vehicle in Consignments by All Modes according to length of haul

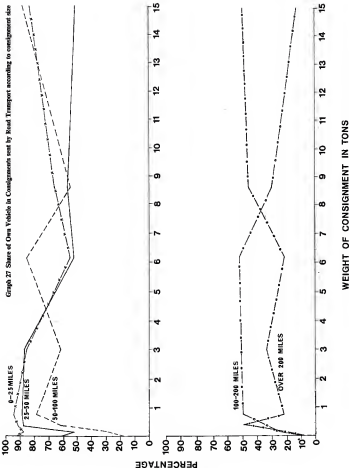


Graph 25 Share of Own Vehicle in Consignments by All Modes according to consignments size



Graph 26 Share of Own Vehicle in Consignments sent by Road Transport according to length of haul





# Rail/Transport on own account

This model was similar to that for Road haulier/Transport on own account with the exception of variable 17 ('A contract' arrangement) being replaced by variable 15 (private rail siding). The significant variables and their standard errors are given below:

$$Y = \begin{matrix} 1 & \text{Rail} \\ 0 & \text{Transport on own account.} \end{matrix}$$

| Constant                              | -0.01 |         |
|---------------------------------------|-------|---------|
| (1) Haul                              | 0.36  | (0.009) |
| (4) Weight                            | -0.11 | (0.006) |
| (5) Regularity                        | -0.11 | (0.011) |
| (6) Container                         | 0.11  | (0.013) |
| (7) Special body                      | -0.14 | (0.029) |
| (8) Inter-establishment move          | 0.04  | (0.016) |
| (9) Urgency                           | -0.05 | (0.011) |
| (10) Ancillary service                | -0.13 | (0.023) |
| (11) Raw feedstock                    | 0.41  | (0.17)  |
| (11) Iron and Steel                   | 0.25  | (0.024) |
| (11) Building materials and materials | 0.13  | (0.021) |
| (11) Transport vehicles and equipment | 0.05  | (0.009) |
| (11) Non-ferrous metals               | -0.13 | (0.015) |
| (11) Metal manufactures               | 0.37  | (0.022) |
| (12) Destination (Northern)           | 0.06  | (0.022) |
| (12) Destination (East Midlands)      | -0.06 | (0.015) |
| (12) Destination (East Anglia)        | 0.07  | (0.015) |
| (12) Destination (South Eastern)      | -0.05 | (0.012) |
| (12) Destination (South Western)      | 0.06  | (0.009) |
| (12) Destination (Wales)              | 0.07  | (0.027) |
| (13) Origin (Yorkshire)               | 0.06  | (0.016) |
| (13) Origin (East Anglia)             | -0.09 | (0.026) |
| (14) Size (2)                         | -0.10 | (0.010) |
| (15) Private siding                   | 0.21  | (0.023) |
| (16) Own vehicle                      | -0.16 | (0.022) |
| (22) Speed to maintain low stocks     | 0.31  | (0.034) |
| (23) Ready availability               | 0.09  | (0.015) |
| (24) Freedom from loss                | 0.26  | (0.023) |

R=0.74

# Rail/Road haulier

This model was similar to that for Rail/Transport on own account except that variable 16 (Own vehicle) was replaced by variable 17 ('A contract' arrangement).

$$Y = \begin{matrix} 1 & \text{Rail} \\ 0 & \text{Road haulier} \end{matrix}$$

| Constant                                 | 0.39  |         |
|--|-------|---------|
| (1) Haul                                 | 0.17  | (0.015) |
| (4) Weight                               | -0.15 | (0.005) |
| (5) Regularity                           | -0.04 | (0.012) |
| (6) Container                            | 0.09  | (0.015) |
| (7) Special body                         | -0.16 | (0.045) |
| (8) Inter-establishment move             | -0.06 | (0.030) |
| (11) Iron scrap                          | -0.22 | (0.029) |
| (11) Iron and steel                      | 0.34  | (0.023) |
| (11) Chemicals                           | -0.28 | (0.026) |
| (11) Electrical goods                    | -0.13 | (0.029) |
| (12) Destination (Yorkshire)             | -0.05 | (0.020) |
| (12) Destination (South East)            | -0.06 | (0.014) |
| (12) Destination (Wales)                 | 0.10  | (0.030) |
| (13) Origin (Northern)                   | 0.14  | (0.065) |
| (13) Origin (Yorkshire)                  | -0.07 | (0.016) |
| (13) Origin (East Midlands)              | -0.21 | (0.016) |
| (14) Size (2)                            | -0.06 | (0.016) |
| (14) Size (3)                            | 0.10  | (0.020) |
| (15) Private siding                      | 0.34  | (0.034) |
| (17) 'A contract' arrangement            | 0.02  | (0.017) |
| (20) Speed to meet customer requirements | -0.11 | (0.019) |
| (21) Turn-round speed                    | -0.12 | (0.017) |
| (23) Ready availability                  | -0.04 | (0.020) |
| (24) Freedom from loss                   | -0.26 | (0.023) |

R=0.72

Testing the assumed shape of the function relating the proportion of consignments sent by rail and length of haul the results are as below.

$$P(\text{rail}) = -0.44 + 0.44 (\log \text{haul})$$

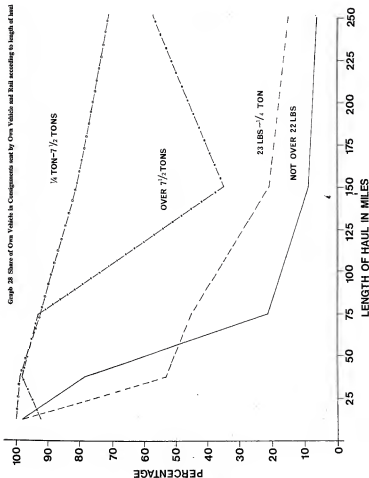
| Haul (miles) | Estimated percent | Actual percent |
|--------------|-------------------|----------------|
| 5            | 0                 | 1              |
| 37½          | 25                | 13             |
| 75           | 38                | 31             |
| 150          | 51                | 56             |
| 225          | 59                | 62             |

There is again a discrepancy at the lower end of the distribution; and examination of graph 28 below shows that with the exception of consignments over 7½ tons of which there were comparatively few, the assumed shape of the probability function holds for all weight classes.

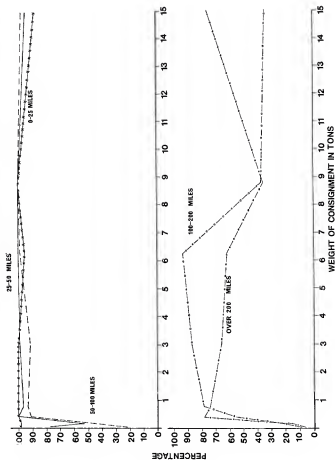
Graph 29 below shows a much clearer relationship between consignment weight and the distribution of consignments between modes for all lengths of haul under 200 miles. The assumed functional relationship would appear to have been the correct one.



Graph 28 Share of Ores Vehicle in Consignments sent by Ores Vehicle and Rail according to length of haul



Graph 20 Share of Own Vehicle in Consignments sent by Own Vehicle and Rail according to consignment size



This analysis was carried out with and without the subjective assessments; in the former consignment size was the first step in the regression, and in the latter length of haul. It was possible, therefore, to test the assumed probability functions for both these factors.

In testing the assumed shape of the function relating the proportion of consignments sent by rail and length of haul, it has been assumed that observations are normally distributed in all length of haul classes and that the mileage for the highest class is 250 miles. The results are as below:

$$P(\text{rail}) = -0.19 + 0.24 (\log \text{haul}).$$

| Haul<br>(miles) | Estimated<br>per cent | Actual<br>per cent |
|-----------------|-----------------------|--------------------|
| 12.5            | 7                     | 11                 |
| 37.5            | 19                    | 36                 |
| 75              | 26                    | 28                 |
| 150             | 33                    | 40                 |
| 250             | 39                    | 44                 |

The large disparity at 37½ miles between the estimated and actual proportions probably results from sampling error in the actual proportion. An examination of Graph 30 below indicates that the assumed shape of the probability function was correct.

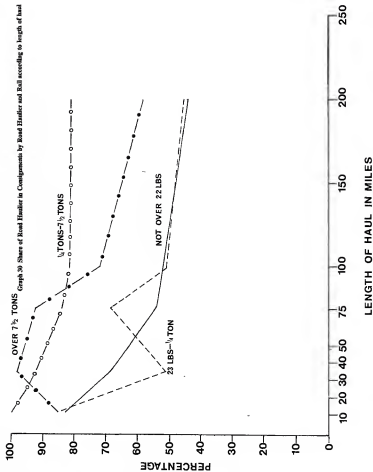
In testing the assumed shape of the function relating the proportion of consignments sent by rail and consignment weight it was assumed that all consignments were normally distributed within the classes, and the mid points of the classes in Table 3 were taken assuming an upper weight of 12 tons. The estimating equation and estimated and actual proportions of consignments are given below:

$$P(\text{rail}) = 0.55 - 0.12 (\log \text{consignment weight})$$

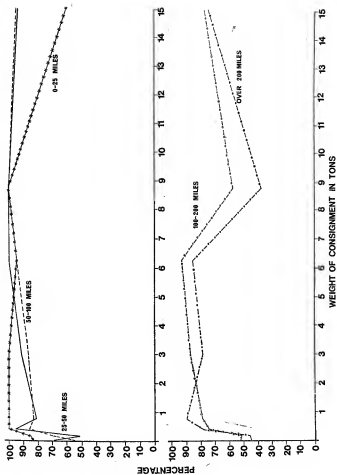
| Consignment weight | Estimated % | Actual % |
|--------------------|-------------|----------|
| 11½ Tons           | 42          | 44       |
| 67                 | 32          | 45       |
| 334                | 25          | 41       |
| 868                | 20          | 21       |
| 1689               | 16          | 17       |
| 6779               | 9           | 15       |
| 14000              | 5           | 9        |
| 29600              | 4           | 3        |
| 26389              | 2           | 2        |

The estimated proportions are inaccurate for the second and third consignment weights but Graph 31 does not suggest that the fitting of a different type of function would have been more appropriate.

In order to obtain information on price the ratio charge by rail/charge by road haulier was included in a model based upon the most significant variables of the above model. The price ratio had the anticipated negative sign but was not significant at the 5 per cent level. The model was based upon only 260 observations as information on relative charges was only available for this number, and this was not a random sub-sample as the co-efficients were rather different from those in the above model. This does not mean, however, that the result is not of value, for, as was previously argued (see p. 50), it is reasonable to assume that where the charges for consignments are known for alternative modes these consignments will be different in character from those where charges by alternative modes are not known.



Graph 31 Share of Road Haulier in Consignments by Road Haulier and Rail according to consignment and size



## The charges model

The analysis was carried out on consignments in the General Survey (see Introduction for definition) sent by rail or professional road haulier. The charges are those actually paid by shippers for particular consignments and it was considered that for rail these would be a function of the following variables:

- 1 Commodity
- 2 Length of haul (miles)
- 3 Weight of consignment (lbs)
- 4 Regularity
- 5 Region of origin
- 6 Region of destination
- 7 Total annual tonnage shipped by rail from establishment
- 8 Type of rail service used
- 9 Container used
- 10 Name of shipper (or product) displayed on wagon
- 11 Special wagon body required
- 12 Method of collection
- 13 Extra service required.

For the road haulage charges model variables (8) and (12) were omitted, variable (7) was changed to 'total annual tonnage shipped by road haulier from establishment', and a new variable 'consignment required urgently' was added. This new variable is one of the measures of the type of service being demanded and acts in the same way on charge as type of rail service.

The need for most of these variables is obvious but a number are discussed in more detail below, especially with reference to their treatment in the model.

### Commodity

Thirteen commodity groups were differentiated and entered as dummy variables in the model. As was pointed out in the Introduction these groupings tend to be fairly heterogeneous and only very general conclusions about their influence on charges can, therefore, be drawn. A statistical analysis of the five special commodities has not been carried out because of budget constraints but charges for these commodities with respect to haul and consignment weight have been plotted in Part III, Chapter 2 with free hand lines of best fit.

### Regularity

This was treated as a dummy variable but only regular and irregular traffic were differentiated. The basis of the split was of shipments sent at least once monthly and those shipped at greater intervals than a month. The introduction of this variable was based on the supposition that charges will be higher if traffic is irregular, other things being equal, because planning is made more difficult for the operator.

### Origin and destination

Origins and Destinations were confined to the 10 Planning Regions each one representing a separate dummy variable in the model. Origins and destinations were included in the model on the presumption that the charges would be higher, other things being equal, for traffic originating in or going to regions which generated comparatively small quantities of traffic because of reduced chances of obtaining additional outgoing, or return traffic. Ideally the traffic densities of particular routes should be taken into account, but with so many regressor variables already in the analysis it was not feasible to take combinations of origins and destinations into account.

### Annual tonnage shipped

This was introduced to measure possible economies of scale from bulk shipping.

### Type of service

For rail traffic 6 dummy variables were introduced representing the eight types of rail service differentiated on the special consignment notes. Train load and wagon load services are, of course, a function of the size of consignment and were not expected to be significant, but for passenger and freight sundries services there is no such dependence upon consignment size. For road haulage speed of delivery was taken into account by use of the dummy variable 'consignment required urgently.'

### Method of collection

Only two methods of collection of rail traffic were differentiated: namely, whether the consignments were collected by British Rail or not.

### Extra service

Often extra services are performed by the operator in the form, for instance, of warehousing or collection of payments. Types of ancillary services were not differentiated, only the existence of such a service was taken into account by the use of a dummy variable.

### Type of analysis

Multiple regression analysis was employed with the following form of estimating equation:

$$C = AH^{\alpha}W^{\beta}T^{\gamma} \text{ anti-log } D^{\delta}$$

which is linear in the logs:

$$\log C = \log A + \alpha \log H + \beta \log W + \gamma \log T + \delta D$$

and where:

- C = charge  
A = constant  
H = haul in miles  
W = consignment weight in lbs  
T = annual tonnage shipped from establishment by mode in question  
D = representative dummy variable

#### Factors influencing rail charges

The values of the co-efficients for the rail data which were significant at the 5 per cent level are given below with standard errors. As the logarithmic values of the continuous variables were used their co-efficients may be directly interpreted as elasticities which are constant over the whole range of observations.<sup>3</sup>

|                             |              |        |
|-----------------------------|--------------|--------|
| Constant                    | 0.48         |        |
| Length of haul              | 0.31 (0.02)  |        |
| Container used              | 0.06 (0.03)  |        |
| Consignment weight          | 0.71 (0.01)  |        |
| Method of collection        | -0.15 (0.03) |        |
| Manufactured foodstuffs     | -0.34 (0.04) | R=0.97 |
| Chemicals                   | 0.25 (0.05)  |        |
| Electrical goods            | 0.16 (0.04)  |        |
| Metal manufactures          | -0.13 (0.03) |        |
| Destination (North Western) | 0.05 (0.02)  |        |
| Passenger service           | 0.28 (0.02)  |        |

#### Factors influencing road charges

The analysis of road charges gave similar results, and the significant co-efficients with their standard errors are listed below:

|                                   |              |        |
|-----------------------------------|--------------|--------|
| Constant                          | 0.56         |        |
| Length of haul                    | 0.27 (0.01)  |        |
| Container used                    | 0.06 (0.03)  |        |
| Consignment weight                | 0.63 (0.01)  |        |
| Special body required             | 0.27 (0.01)  |        |
| Consignment required urgently     | -0.09 (0.01) |        |
| Name displayed on vehicle         | 0.12 (0.02)  |        |
| Annual tonnage shipped by haulier | -0.03 (0.01) |        |
| Manufactured foodstuffs           | -0.23 (0.02) | R=0.95 |
| Iron scrap                        | -0.17 (0.01) |        |
| Chemicals                         | -0.12 (0.01) |        |
| Building materials and materials  | -0.19 (0.01) |        |
| Transport vehicles and equipment  | 0.14 (0.02)  |        |
| Metal manufactures                | 0.07 (0.02)  |        |
| Origin (Yorkshire)                | 0.07 (0.01)  |        |
| Origin (Scotland)                 | 0.06 (0.02)  |        |
| Destination (Northern)            | -0.06 (0.02) |        |
| Destination (East Midlands)       | 0.05 (0.02)  |        |
| Destination (East Anglia)         | 0.05 (0.02)  |        |
| Destination (North Western)       | -0.04 (0.01) |        |

In both models consignment weight was by far the most significant variable, explaining more than four-fifths of the variation in charges. Most of the co-efficients are of the anticipated size but the origin and destination ones warrant special mention.

In the table below the proportion of rail and road haulage consignments originating in and consigned to each of the Planning Regions is given along with the zero order correlation coefficient which indicates the degree to which origin and destination occurs in the same region.

#### 1. Now an elasticity

The elasticity of charge with respect to consignment size in an arithmetic linear function would be:

$$\begin{aligned} \frac{\% \text{ change in charge (C)}}{\% \text{ change in consignment weight (W)}} \\ \frac{\Delta C}{C} \cdot \frac{100}{\Delta W} \\ \frac{\Delta C}{C} \cdot \frac{W}{\Delta W} \end{aligned}$$

$$\frac{\Delta C}{C} \cdot \frac{W}{\Delta W} = \frac{\partial C}{\partial W} \cdot \frac{W}{C}$$

$\frac{\partial C}{\partial W}$  is, of course the slope co-efficient and is constant over the whole range, but the value of  $\frac{W}{C}$  is constantly changing thus the elasticity will vary over the whole range of observations. A change in a logarithmic value is, however, a proportionate change thus the elasticity of charge with respect to consignment size is a log-linear function is  $\frac{\partial \log C}{\partial \log W}$  which is the slope and, therefore, constant. It should be noted, however, that this is a constant point elasticity and holds for only very small changes.

| Planning Region | % Rail consignments |             |       | % Road haulage consignments |             |      |
|-----------------|---------------------|-------------|-------|-----------------------------|-------------|------|
|                 | Origin              | Destination | r     | Origin                      | Destination | r    |
| Northern        | —                   | 9           | —     | —                           | 4           | —    |
| Yorkshire       | 27                  | 9           | 0.08  | 30                          | 11          | 0.20 |
| East Midlands   | 5                   | 7           | 0.04  | 30                          | 7           | 0.13 |
| East Anglia     | 19                  | 2           | -0.02 | 7                           | 3           | 0.14 |
| South East      | 4                   | 18          | 0.06  | 13                          | 30          | 0.24 |
| South West      | —                   | 8           | —     | —                           | 4           | —    |
| Wales           | —                   | 3           | —     | —                           | 3           | —    |
| West Midlands   | —                   | 13          | —     | —                           | 11          | —    |
| North West      | 27                  | 14          | -0.06 | 30                          | 30          | 0.16 |
| Scotland        | 18                  | 12          | 0.06  | 10                          | 7           | 0.08 |
|                 | 100                 | 100         |       | 100                         | 100         |      |

It must be remembered that the catchment area is confined to two routes and that, therefore, certain regions are excluded as origins. For rail consignments the co-efficients of correlation between region of origin and destination are extremely low and in two cases negative, it can be concluded, therefore, that a very high proportion of rail traffic is inter-regional. For road haulage the correlation co-efficients are very much higher than for rail but are still quite low. There are, therefore, a very much higher proportion of intra-regional movements in road haulage traffic than rail traffic, but, nevertheless, a fairly substantial proportion of road haulage traffic is inter-regional.

The correlation co-efficients indicate that rail consignments originating in East Anglia and the North West are despatched on longer hauls than is the case in other regions, and one would expect, therefore, that the charges would be somewhat higher for these regions other things being equal. The analysis of rail charges showed that this was the case for consignments originating in the North West, but when the origin was East Anglia this was not a significant factor influencing rates.

If we could assume that, with the two exceptions already mentioned, there were no significant differences between the size and length of haul of consignments originating in different regions<sup>1</sup> one could test to see if the total traffic generated in or received by a region influenced rates. This is, of course, a very feasible hypothesis because one would expect that if there is a good chance of obtaining additional outward traffic and/or return traffic the rates would be lower than when this was not the case other things being equal.

In the case of rail traffic origin and destination as such appeared to have no influence on the charge, but in the case of road haulage a number were just significant. If the traffic generation hypothesis is correct the table above would indicate that consignments either originating in or consigned to Yorkshire, East Midlands, South East and the North West would face more favourable rates, other things being equal than traffic originating in or consigned to either East Anglia or Scotland.<sup>2</sup>

Reference to the analysis of road haulage charges shows that with the exception of Yorkshire consignments either originating in or destined to Scotland or East Anglia faced higher charges than was otherwise the case. The table above would further indicate that consignments either originating in or consigned to Yorkshire, East Midlands, South East and North West faced lower charges, other things being equal than those for a neutral (ie non-significant) region. In the case of the East Midlands and the North West this was the case, but the South East was a neutral region and Yorkshire worked to increase rather than reduce charges.

There does appear to be a little, but certainly not conclusive, evidence that the region of origin or destination does have an influence on road haulage rates. But definite conclusions could only be drawn if it were possible to take many more regions; combinations of regions; and isolate the influence of haul and consignment size as between regions.

<sup>1</sup> In so far as regions specialise in certain types of industry and are differently situated with respect to markets this is a somewhat questionable assumption.

<sup>2</sup> One cannot make assumptions about the remaining four regions because it is not known how important they are in generating traffic.



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